ABSTRCT

Title of Dissertation: THE USE OF CONSTANT TIME DELAY IN THE ACQUISITION OF INCIDENTAL LEARNING WHEN TEACHING SIGHT WORD RECOGNITION TO STUDENTS WITH MODERATE AND SEVERE DISABILITIES

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Young students with moderate and severe disabilities were taught reading sight words with the Constant Time Delay (CTD) procedure. The definitions of these words were indirectly taught (i.e., incidental learning) by embedding them as non-targeted information in the CTD teaching routine. A multiple probe design across word sets and replicated across subjects was used to determine the effectiveness of the CTD procedure in directly teaching sight words and indirectly teaching their definitions. It was predicted that students with moderate and severe disabilities would acquire, maintain, and generalize the sight words that were directly taught as well as learn incidentally their definitions.

Analysis of the data collected during this investigation revealed that CTD procedure was an effective method for teaching sight words and fostering incidental learning of word definitions for student with moderate and severe disabilities. The introduction of CTD procedure resulted in all six participants obtained the criterion of reading all taught words correctly for three sessions in a row. These results were also maintained over time. All students further learned some of the word definitions incidentally; the average number of definitions learned by the six students ranged form 43% to 96%.

Students' ability to generalize their knowledge of the target sight words and their definitions to a new investigator and different task were mixed. When these words were presented by another adult, students correctly read 33% to 75% of the words, depending upon the child and the word set. Whenever a child read a word correctly, he or she was able to provide the correct definition. These results support the effectiveness of CTD procedure to teach sight words and their definitions to students with moderate and severe disabilities.

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By

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Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland at College Park in a partial
fulfillment of the requirement for the
degree of Doctor of Philosophy
2001

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DEDICATION

This dissertation is dedicated to my parents, my wife, and my kids for their love, patient, support, encouragement and belief in me.

ACKNOWLEGEMENT

It is with deepest gratitude that I acknowledge those persons who provided support and assistance during my doctoral studies. First, I would like to thank my doctoral committee. I would like to extend special gratitude to my advisor and the chair of the committee, Dr. Steve Graham who provided invaluable effort, encouragement, direction, and support throughout my graduate studies at the University of Maryland, and especially in the completion of this project.

In addition, I would also like to thank Dr. Andrew Egle for his ongoing support and academic guidance during the preparation of this project. Special Thanks to Dr. Frances Kohl for her support in early planning stages of this project. Special appreciation is also extended to Dr. David Cooper and Dr. Allan Wigfield for their support, suggestions, and encouragement during this project.

I owe a debt of gratitude to Mr. Walter F. Frazier, the principal of Central Special Education School, for his cooperation and assistance in completion of this study. Without his support, this would not have possible. Special thanks to for the staff, teachers and the students for supporting me and making this endeavor possible.

I am grateful to my parents, back in Saudi Arabia who have taught me to walk with the God as my guide. Special thanks for my wife and my children for their love, encouragement, and support in helping me achieving my goal, and inspired and directed my bath by providing the necessary reassurance throughout the most difficult times.

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Introduction

Education reform has changed educational practices for both teachers and students, and the trend towards educating all students in inclusive settings presents a challenging task for both regular and special educators (Whalen, Schuster, & Hemmeter, 1996). These challenges increase when education involves students with moderate and severe disabilities. Fishbach-Goodman (1996) reported that some of these challenges include the development of creative ways to educate students with and without disabilities as well as the development of more creative ways to deal with the demands of different students.

Prior to the late 1960s, research on reading with children with moderate mental retardation was practically nonexistent. This was due to the emphasis given to other skills as well as the widespread notion that these children could not learn to read. More recent research shows that this notion was misguided and further suggested that behavioral techniques are powerful tools for teaching a fundamental functional sight words/phrases vocabulary to these students (Richek, Caldwell, Jennings, & Learner, 1996).

With the recent shift in special education services from an emphasis on safety and vocational skill development to an emphasis on daily living skills and involvement in community activities, the importance of teaching functional sight words/phrases recognition has increased substantially. Reading has been categorized as an essential skill that is critical to enhancing the level of independence achieved by students with moderate and severe disabilities. Browder and Xin (1998) reported that recognition of

reading words on sight reduces dependence on others and increases opportunities for social interaction for students with moderate and severe disabilities.

One way to define functional sight words/phrases reading is as a discrete, observable response that is controlled by a printed stimulus (Brown & Perlmutter, 1971). This printed stimulus sets the stage for a verbal response by the student. If a student does not initiate a response, the teacher may deliver a verbal prompt to do so or model the correct response. When the student becomes used to this modeled response, the teacher then transfers stimulus control from the model to the printed word; this is done to control the reading response.

Richek et al. (1996) further defined functional sight words/phrases as those words that are recognized in print immediately, without analysis. This recognition enables students to read fluently in context and comprehend text. Because word recognition is, in part, dependent on the development of speaking, listening, reading, and writing, students with more moderate and severe disabilities often experience difficulties acquiring emergent literacy skills, such as word recognition (Singh & Singh, 1986).

The importance of word recognition to the independent functioning of students with moderate and severe disabilities has created the need to identify effective and efficient instructional procedures for teaching this skill. As a result, a number of teaching procedures and strategies have been developed and tested by researchers (Wolery et al., 1992). Recent investigations and reviews of literature on teaching functional sight words/phrases recognition to students with moderate and severe disabilities have highlighted the effectiveness of systematic, near errorless learning

strategies (Browder & Xin, 1998). Among the systematic instructional strategies that have been shown to be effective are constant and progressive time delay (Wall, 1996). With both of these procedures, a stimulus is presented and followed by a teacher prompt to respond. These two procedures differ slightly, however, as the delay period between stimulus and teacher prompt in progressive time delay (PTD) increases gradually between the presentation of task direction and the teacher prompt (e.g., 0, 2, 4, 6-s). Constant time delay (CTD) however, increases the prompt delay interval from a 0s second delay to a fixed period of time (e.g., 0s to 4-s).

Although both of these procedures have been employed effectively in teaching functional sight words/phrases to students with moderate and severe disabilities, PTD does not appear to be as parsimonious as the CTD procedure. Rhodes (1998) indicated, for example, that PTD is not as effective as CTD because the delay interval must be gradually increased over trials or sessions. Constant time delay is simpler to implement, as only a single delay interval is used.

The simplistic nature and high level of effectiveness make the CTD procedure parsimonious in teaching new skills to students with moderate and severe disabilities. Typically, this population, by definition, has intense mental, emotional, and/or physical problems. Furthermore, as they may possess severe language, cognitive, and/or perceptual difficulties, they are in need of an effective method that can quickly and efficiently teach them enough critical information to successfully help them participate in class, community, and social activities (Rhodes, 1998).

The use of the CTD procedure maximizes learning opportunities for students with moderate and severe disabilities, who often experience difficulty in responding

appropriately to naturally occurring environmental stimulus, which make it more difficult to learn basic life skills. This is implemented by employing extra-stimulus prompts that promote the transfer of stimulus control to natural environmental stimuli. The CTD procedure provides students with a prompt that inserts a predetermined fixed-delay interval between the presentation of the task direction and the controlling prompt. The delivery of the prompt is systematically faded as it occurs between the presentation of the task direction that cues the student to perform the task and the controlling prompt that ensures the correct response will occur.

Wolery, Holcombe, et al. (1992) reported that the CTD procedure was at least as efficient as PTD as well as more efficient than the behavioral techniques of least to most and stimulus fading. Browder and Xin (1998) noted in their review on functional sight words/phrases instruction for students with moderate and severe disabilities, that the most utilized method was the CTD procedure. In all studies that used time delay applications, 73% used the CTD procedure over the PTD procedure. Some conclusions regarding the CTD procedure include, but are not limited to the following: a) it is effective as students acquire the target task with few errors; b) it is efficient in that students master the task with few trials; c) it is effective with all ages groups, from children to adults; d) it can be delivered by adults, peers, or via the computers, e) it is effective when used one-to-one and in small group arrangements; and f) it is effective when trials are distributed throughout an activity or the day.

The CTD procedure can also provide opportunities for students with moderate and severe disabilities to learn extra information embedded in the instructional regime. Additional related information can be inserted into instructional trials in several places;

antecedent events that happen prior to the student responding, in prompt hierarchies, and/or in consequent events that appear after the student responds (Wolery et al, 1992). This embedded information may be learned incidentally, as the students receive instruction on the target information. Or in other words, it is “learning that occur outside of the assigned task” (Travers, 1971, p.326).

Incidental learning is a manipulation of the instructional designs to allow students to acquire additional information within the same amount of instructional time. Incidental learning also involves constantly presenting additional, non-target stimuli during the presentation of instruction. Although the presentation of the extra information is not expected to be fully mastered by the student, this arrangement is efficient in that students gain extra information as they master the target skills. For example, if the target skill is the recognition of functional sight words/phrases, non-target information embedded in the instructional task might include the word definition. Thus, the student not only learns to recognize the target words, but masters some of their definitions as well.

The attention given to the acquisition of incidental learning (non-target) information has increased during recent years. Incidental learning has been shown to be effective in both small group and one-to-one instruction. Small groups, however, were reported to be more effective and efficient in teaching incidental learning to students with moderate and severe disabilities (Wolery et al, 1992). Nevertheless, empirical investigations have reported that the one-to-one arrangement is more frequently used than small group arrangement. For example, Wolery, Holcombe et al. (1992) indicated in their comprehensive review that the use of one-to-one instruction when teaching the

constant time delay procedure was present in 26 of the 36 studies reported. Additionally, Schuster, Morse et al. (1996) reported in their review of constant time delay chained task literature, that one-to-one arrangement was used in 14 of 19 studies. Further indication of the preeminence of the use of one-to-one instruction is also apparent when addressing how individual skills are taught. For instance, when teaching grocery shopping skills to individuals with moderate disabilities, Morse, Schuster, and Sandknop (1996) noted that a one-to-one instructional arrangement was used in 17 of the 20 studies (Schuster, Morse, Griffen, & Wolery, 1996).

In summary, two common means of setting the stage for incidental learning are: (1) the use of instructional arrangements that consist of one learner, and (2) the systematic presentation of non-target information within the instructional sessions. As Wolery and Gast (1991) noted, both strategies can promote positive outcomes. These include more rapid learning as well as an increase in generalized performance and acquisition of behaviors not targeted for instruction.

Statement of the Problem

There is a fairly reasonable research base that supports the use of the various instructional components employed in this study. These components include the use of constant time delay and incidental learning to teach functional sight words/phrases to students with moderate and severe disabilities. However, there is a paucity of research available on the combined aspects of these instructional components. Few studies have examined CTD plus incidental learning with students with moderate and severe disabilities. The proposed study included six (6) students with moderate and severe disabilities. This was a relatively high number of subjects compared with previous

studies, where the median number of subjects was four. Thus, the current study represented one of the most ambitious investigations of the combined effects of CTD and incidental learning in the teaching of functional sight words/phrases to students with moderate and severe disabilities.

The current study further differed from previous studies, as children from 5 to 8 years of age were employed as subjects. None of the other studies in this area have studied this age group. Only one study, conducted by Alig-Cybriwsky, Wolery, and Gast (1990) worked with children younger than six (pre-schoolers with an average age of five years). In all other studies available the average age ranged from 9.9 to 39.7 years.

Research Questions

This investigation sought to answer the following questions related to the acquisition of functional sight words/phrases via CTD and word definition via incidental learning with students with moderate and severe disabilities.

1. Will the constant time delay (CTD) procedure promote the acquisition of sight words?

2. Will the inclusion of related, non-target information (i.e., word definition) in response praise and correction statements during CTD promote the acquisition of this information?

3. Will students maintain the functional sight words/phrases and definitions they acquired during instruction?

4. Will students generalize the functional sight words/phrases and definitions acquired during instruction?

Purpose of the Study

The purpose of this study was to expand the extent of available literature on the acquisition of incidental learning when using the CTD procedure to teach functional sight words/phrases recognition to students with moderate and severe disabilities. This study addressed the following three hypotheses: (a) participants with moderate and severe disabilities will recognize targeted functional sight words/phrases with less than a 10% error rate through the use of a 5s CTD procedure, (b) participants with moderate and severe disabilities will acquire the definitions of these words through incidental learning, and (c) participants with moderate and severe disabilities will maintain and generalize functional sight words/phrases and definitions acquired during instruction.

Definition of Terms

Acquisition. The fundamental degree of student response ability and capability. This involves the student's ability to perform a newly learned response to a desired level of accuracy.

Attentional Response. The movements a student uses to illustrate to the teacher that he or she is attending to the instructional prompts.

Attentional Cues. An investigator's actions, questions, or statements that provide a clear signal to draw the student's focus to the instructional stimuli.

Constant Time Delay. An instructional response prompting procedure that is considered to be a practically errorless strategy. The instructional trials used with CTD procedure include a fixed, unchanged amount of time that is inserted between the presentation of the stimulus that cues a student to perform a task and the controlling prompt.

Controlling Prompt. A behavior presented by the teacher to increase the probability of a correct response by the student when performing the target behavior.

Criterion. A predetermined degree of desired performance that indicates a student's learning of the required task or behavior.

Discriminative Stimulus. A cue that prompts the student to perform a specific target behavior that is later reinforced when the target stimulus is present.

Error Correction Procedure. An instructional strategy where the response prompt is provided in the consequent event after error responses. The goal of error correction procedure is to provide as minimal an amount of assistance as possible, while providing enough assistance to ensure subsequent correct performance.

Five Second Delay. A term used with constant time delay procedure describing 5 seconds of time inserted between the target stimulus and the controlling prompt.

Generalization. The expansion of a student's ability of performance beyond those conditions set for initial acquisition. Wolery et al. (1992) defined generalization as correct responding in situations other than the training situation (e.g. across persons, across materials, across natural consequences, across stimuli, across setting, and across time)

Incidental Learning. The acquisition of information that is not directly related to the main instructional task, or non-target information that is presented in the instructional environment.

No Response Error. A student fails to initiate a response within a specified amount of time after the response and back-up prompt are provided.

Maintenance. The continued performance of the targeted behavior after instruction has stopped.

Moderate and Severe Disabilities. Refers to those individuals who are functioning at a general developmental level of 55 or below on a standardized, individually administrated test of intelligence (IQ), and also who exhibit significant impairment in two or more adaptive behavior areas (i.e., functional academics, communication, health and safety, home living, social skills). Additionally included in this definition are students who manifest learning and/or behavioral problems of such magnitude and significance that they require extensive structure in learning situations if their education needs are to be well served (Justin, 1976).

Probes. A sequence for testing trials to assess whether the student can perform the target behavior with less assistance than is currently used during instruction (Wolery et al, 1992).

Progressive Time Delay. A response prompting procedure characterized by increasing the amount of time between the presentation of the target stimulus and the response prompt. This involves fading the controlling prompt by gradually inserting an increasing time delay (e.g., 2-s increment) between the discriminative stimulus and the controlling prompt.

Prompted Correct. Also known as nonwait errors, in which the student make a correct response following the delivery of the controlling prompt (Fissbach-Goodman, 1996).

Prompted Error. Also known as wait errors, and occur when the student makes an incorrect response after the controlling prompt is delivered.

Response Prompting Procedures. Procedures that provide and fade teacher prompts to increase the probability of correct responding in the presence of the discriminative stimulus. This allows reinforcement to be provided to build stimulus control.

Functional sight words/phrases Recognition. Involves being able to recognize the visual form of words instantly without further analysis. Functional sight words/phrases reading has been defined as “a discrete observable response that is controlled by a printed stimulus” (Brown & Perlmutter, 1971).

Stimulus Control. The reliable or predictable performance of a behavior in the presence of the discriminative stimulus and the absence of that behavior when the discriminative stimulus is absent.

Task Direction. A question or command given by the investigator that signals the student to respond, but does not tell the student how to respond.

Unprompted Correct. Accurate performance of the target response by a student before delivery of the prompt within the specified response interval (Wolery et al,1992).

Unprompted Error. Inaccurate performance of the target response by a student before delivery of the prompt within the specified response interval (Wolery et al,1992).

Verbal Prompt. A response prompt consisting of verbal statements directed to the student to increase the probability of correct responding.

Word Recognition. Torgeson (1985) defined as a process involving the following manner: “the phonological constituent of words must be obtained from their graphic representation, stored in sequence then blended together while the child

searches his/her memory for a real word that roughly matches the string of phonemes produced by the blending operation" (p.354)

0s Second Delay. A term used with constant and progressive time delay procedures, indicating that no time is inserted between the presentation of the instruction and the controlling prompt.

Chapter 2

Review of Literature

Characteristics of persons with moderate and severe disabilities

Individualizes with moderate and severe disabilities embrace a very diverse group (McDonnell et al, 1995). Hardman, Drew, and Egan (2002) indicated that the multitude of characteristics exhibited by people with moderate and severe disabilities is represented by the numerous definitions associated with these conditions. A close look at these definitions indicates that these individuals cannot meet life needs without substantial support from others, including family, friends, teachers, and society. Their disability is characterized by dysfunctions in one or more of the following areas: intellectual abilities, adaptive behavior, speech skills, physical and health capabilities, and visual perception (Dowing, 1998; Hardman et al., 2002).

Intellectual abilities. Mental retardation is one of the primary conditions associated with moderate and severe disabilities (Hardman et al, 1993). Hickson, Blackman, and Reis (1995) noted that persons with mental retardation have central processing limitations in memory, classification, reasoning, and evaluation. They also have difficulties with executive functioning. The more pronounced the mental retardation, the more difficulty that individuals have communicating, learning, or participating in the community.

McDonnell et al. (1995) reported that approximately 60 percent of people with cerebral palsy are mentally retarded (Batshaw & Perret, 1986). A significant percentage of persons with mental retardation also have seizure disorders or spina bifida (Brimer, 1990), and nearly half of the persons with seizure disorders also have intellectual

impairments (Rodin, Shapiro, and Lennox, 976). Persons with mental retardation may further have behavioral difficulties (Reiss, 1990a).

As a result of their lower intellectual capabilities, most persons with moderate and severe disabilities experience difficulty learning basic academic skills. They require specialized instructions that sequentially and systematically teach them how to learn and apply important skills at school, home, work, and in the community.

Adaptive behavior. Adaptive behavior involves skills both personal independence and social interaction; both of these skills are critical to success in natural settings. Personal independence skills involve the ability to take care of basic needs such as eating, dressing, and hygiene. This also includes being able to live independently, keep a job, manage money, and find ways to effectively participate in the community. Social interaction skills involve being able to communicate needs and preferences as well as listening and responding appropriately to others.

Persons with moderate and severe disabilities experience difficulties with adaptive skills and need ongoing assistance to facilitate and enhance their performance in this area. Severe difficulties with adaptive behavior limit their opportunities for independence. However, participating in inclusive settings with high functioning persons increases the probability that persons will learn and maintain adaptive behavior skills over time (Batshaw, 1997).

Speech and language skills. Speech and language development are often used as a measure of children's' more general development. Persons with moderate and severe disabilities experience difficulty in using appropriate speech and language skills (Batshaw, 1997). Generally, they have significant deficits and delay in these skills,

ranging from articulation and fluency disorders to an absence of any expressive oral language. For persons with severely limited speech and language skills, the use of functional communication systems (e.g., signing, picture cards, communication boards) becomes increasingly important.

Physical and health. The range of physical and health disabilities is different from one person to another. It includes conditions that interfere with mobility and coordination as well as conditions that limit strength, vitality, and alertness (McDonnell et al, 1995). Persons with moderate and severe disabilities have a higher incidence of congenital heart disease, epilepsy, respiratory problem, brain injury, cerebral palsy, and spinal cord injuries. They may also exhibit poor muscle tone or conditions such as spasticity, athetosis, and hypotonia.

Vision and hearing. The visual and hearing disability is defined by the type and degree of sensory loss. Sensory loss describes the entire range of auditory and visual loss, ranging from mild through severe. Because visual and hearing difficulties are not uncommon in persons with moderate and severe disabilities, these persons may have difficulties learning through either visual or auditory mode or both (Dowing, 1998).

Other characteristics. In addition to the general characteristics described above, Ryndak and Alper (1996) indicate that for persons with moderate and severe disabilities: (a) their ability rate to learn is slower than their own age peers without disabilities (e.g., they take longer to focus on the relevant stimulus dimensions of a task and to find a solution, (b) they experience difficulties in maintaining the skills that they are taught, (c) they experience greater difficulties in generalizing new academic and

functional skills to new settings or different situations, and (d) they experience greater difficulty in combining skills that they have been taught separately.

Reading Instruction and Persons with Moderate and Severe Disabilities.

Historically, educational programs for students with moderate and severe disabilities have focused primarily on protecting these persons from society and society from them (Hardman et al, 1994). These programs often isolated persons with severe disabilities and provided custodial care rather than preparing them for life in a diverse world. Prior to the passage of the Education for All Handicapped Children Act in 1975 (PL 94- 142), students with moderate and severe disabilities were denied access to a public school education based on the assumption that they were unable to learn. The majority of those students were placed in segregated environments, including state developmental centers and special segregated schools (Dowing, 1996). During the 1980s, however, there was a movement toward reducing the population in the state institutions or closing them entirely. As a result of this movement and litigation, a parallel shift occurred in the delivery of services in schools, with a transformation from special segregated schools to self-contained classes in public schools (Snell & Brown, 2000).

At the same time, the concept of teaching reading to students with moderate and severe disabilities was not considered to be necessary or even a desirable skill due to the assumption that these children could not learn to read (Dowing, 1996). Only during the 1960s were efforts made to teach students with severe disabilities sight vocabulary or functional skills that were characterized as "protective" words. These words included street signs, convenience signs, cautionary words, and names of common objects. The

importance of teaching these skills has increased substantially as a result of the inclusion movement, which encouraged schools and districts to provide equal access to the regular education classroom and the general core curriculum for students with disabilities (Dowing, 1996).

As students with severe disabilities have experienced increased exposure to the less restrictive environment, the need for reading skills has become more crucial. Reading has been categorized as an essential skill that is critical in enabling a person to communicate not only with other individuals, but also with the world in which they live. Increasingly, it has become more important for persons with moderate and severe disabilities to acquire the abilities needed to enhance their level of independence. Reading is the first integral part of being able to perform other fundamental tasks or behaviors, as competence in reading must be acquired in order to successfully participate in community activities. Not only can such skills be useful when competing for employment, but also for engaging in domestic and leisure time activities. Shopping, cooking, and using public transportation are skills needed to enhance a student's ability to achieve some degree of independence in the community (Singh & Singh, 1986).

General Approaches to Teaching Word Recognition

There are several ways to define reading. The majority of these stress the essentials of recognizing the written word or symbol and understanding it's meaning (Stanovich, 1985). It is necessary for the reader to perceive, recognize, understand, and respond to the thoughts that someone has communicated in writing. From an operational perspective, reading can be suitably considered as containing two

interrelated stages. These are word recognition and comprehension. In this review, I concentrate only on word recognition.

Meese (2001) reported that there is no overall agreement on the definition of word recognition. However, the term relies on the process of determining the pronunciation of the written word, and it is often assumed that some degree of meaning is also attached to the word. A person just learning to read typically possesses a considerable oral vocabulary before reading instruction begins. One of the initial skills that beginning readers learn is knowing that for every spoken word there is a corresponding written word. To identify and verbally label a written word, Singh and Singh (1986) identified two means for accomplishing this: 1) instant recognition of words, and 2) mediated recognition of words.

Words that a child is familiar with are called “instantly recognized words.” This familiarity has been achieved through paired associative learning. The association of a spoken word with its corresponding written word can be acquired through discrimination learning, which enables the child to visually discriminate the configuration of the word, utilizing the conditions of its letters, letter sequences, as will as left-to-right and beginning-to-end orientation. Over time, the child recalls these visual cues to instantly recognize the written word.

The use of mediated strategies to recognize new words can be applied when the child faces unknown words in his sight vocabulary. The importance of these strategies is to help determine a word’s pronunciation. The utilization of strategies such as decoding, word attack, word analysis, and word identification can be assessed across several dimensions. The most important of these were identified by Singh and Singh

(1986) as independence, accuracy, speed, and generalizability. These criteria have been used to evaluate several teaching strategies that involve teaching word recognition to students with moderate and severe disabilities. These strategies are described below.

Whole-word or look-and-say methods. The whole-word approach has proven to be the most effective procedure for teaching word recognition skills to students with moderate and severe disabilities (Stanovich, 1985). The use of this method is common in the early stages of reading instruction and later with words that are not easily decoded via word analysis. Words are taught as meaningful wholes and not segmented into syllables or sounds. This common technique is based on the teacher focusing the student's attention on the word, verbally saying the word, and getting the student to label it until the desired criterion is achieved. The whole-word approach requires that each new word is taught individually since this strategy is not designed to promote incidental learning of other similar unknown words.

Phonic analysis. The emphasis of phonetic analysis is the pronunciation of an unknown word based on letter-sound relationships. The student breaks down words into individual letters. The sound of the letter(s) are then identified, and blended together to produce the word. This strategy is extremely useful in teaching students to be independent in reading, assisting them in decoding words that are unknown.

Structural analysis**.** This technique is a combination of whole word and phonetic approaches. It is very useful in teaching the pronunciation of unfamiliar words. It emphasizes the recognition of four basic grammatical structures: prefixes, suffixes, contractions, and compound words. The student learns affixes (e.g., un, re, pre) by sight, which leads to reducing the identification of an unknown word to sounding out

the root word. Once students know the affixes by sight, it increases the likelihood that they will be more efficient in decoding unknown words.

Picture clues. This technique is particularly useful for teaching students with severe disabilities. Students can guess the name of an unfamiliar word by looking at the picture associated with the text. Overemphasis on this approach, however, may inhibit beginning readers' development of other mediating strategies, inhibiting students' development of independence in reading (Singh & Singh, 1986).

In summary, it is believed that these four mediational strategies can assist students with moderate and severe disabilities in pronouncing, and to some extent understanding the meaning of new and unfamiliar words. Nevertheless, several factors such as reading proficiency, reading material, and the teachers' preferences for different techniques may affect the use of mediating strategies). In terms of the four procedures, the whole word approach is considered to be the most popular strategy for teaching word recognition to students with moderate and severe disabilities (Conners, 1992).

Functional sight words/phrases

Much of the research on teaching word recognition to students with moderate and severe disabilities involves functional sight words/phrases instruction, focusing on teaching students to recognize key words in their environment (Conners, 1992). Browder and Xin (1998) viewed functional sight words/phrases instruction as an important component of training for independent living. They reported that learning to recognize words "on sight" should result in less dependence on others and increased opportunities for social interaction for students with severe disabilities. Schloss, Alper et al. (1995) indicated that the acquisition and fluency of words might be enhanced

when providing instruction in both natural and simulated settings. People who are able to read signs, cautions, and costs appear to benefit more fully and independently from community activities than those who cannot read these types of symbols and words.

With functional sight words/phrases instruction, students are taught to recognize key words in their environment by sight without sounding them out. Research has shown that the behavioral techniques that involve more sophisticated stimulus manipulation, but maintain the reinforcement components, are the most effective procedures for teaching functional sight words/phrases to students with moderate and severe disabilities (Brown, Huppler, Pierce, York, & Sontag, 1974). Techniques such as time delay, least to most, most to least, and stimulus manipulation procedures have been found to be both practical and effective in teaching functional sight words/phrases to children with moderate and severe disabilities (Wolery, Ault, Doyle (1992). Additionally, several studies have examined the application of error correction procedure in conjunction with simultaneous prompting (Conners, 1992).

Research on learning to read functional sight words/phrases by students with moderate and severe disabilities indicates that behavioral techniques provide a powerful tool for learning a basic functional sight words/phrases vocabulary (Browder & Xin, 1998). In addition to approaches emphasizing whole word learning, approaches that emphasize procedures for decoding unknown words may also be useful in providing skills for reading untaught words. The findings from several studies indicate that such instruction can help students with severe disabilities read new words they have never seen before (Demchak, 1990; Schoen, 1986).

In the research literature, functional sight words/phrases instruction has been applied to teaching words useful for community skills (Doyle, Schuster, & Meyer, 1996), safety (Collins & Griffen., 1996), and academic reading (Johnson, Schuster, & Bell, 1996). A study by Doyle et al. (1996) provides an example of functional sight words/phrases for community living. They taught four students with severe disabilities to label photographs of grocery items that had been selected by the students' parents. Twenty-six food photographs were selected as target stimuli, which included three photographs of food from the dairy (e.g., sour cream), frozen food (e.g., spinach), and meat (e.g., turkey). Gast, Wolery, Morris, Doyle, and Meyer (1990) and Farmer, Gast, Wolery, and Winterling (1991) provided other examples of studies that taught functional sight words/phrases targeting the environment and community needs of students with severe disabilities. Words such as closed, county, doctor, and dentist were identified by researchers based on the perceived frequency of occurrence in the environment in which students participated

Learning to identify potentially dangerous products is a crucial safety skill. Recognizing key words on product warning labels and understanding their meanings can enhance independence while providing protection from a potentially life-threatening hazard (Collins & Stinson, 1992). Cuvo and Klat (1992), Collins and Griffen (1996), and Collins and Stinson (1995) have emphasized the importace of teaching key functional sight words/phrases that signal danger. A study by Collins and Griffen (1996) illustrated the types of safety words that can be taught to students with moderate disabilities. Four students were taught safe motor responses to products containing key words on the product warning labels. Words such as liquid bleach,

spray oven cleaner, and powdered laundry detergent were taught directly from the labels of the actual products. Students were required to read the words and describe a safe response to the word.

Academic functional sight words/phrases reading typically involves learning words important to students learning in a particular academic area or words that are useful for learning to read. For example, Johnson et al. (1996) selected science vocabulary from a biology textbook based on technical vocabulary taught in mainstream settings. The authors reported that the ability to read these words should decrease dependence on the teacher as well as increase student independence. In contrast, Barbetta, Heward, and Bradley (1993) and Barbetta, Heron, and Heward (1993) generated words for each student to learn from a pool of words identified by the classroom teacher as being included in students' phonics and functional sight words/phrases instruction. Rinaldi. Sells, and McLaughlin (1997) selected words from a Dolch functional sight words/phrases list, a list of words commonly used in reading instruction.

In summary, the majority of research on teaching word recognition to students with moderate and severe disabilities involves functional sight words/phrases instruction. These students have been taught a variety of different types of words including words related to community environment, academic learning, and safety. Research on learning to read functional sight words/phrases indicates that behavioral techniques provide powerful tools for learning basic functional sight words/phrases vocabulary (Wolery et al., 1990). Techniques such as whole word, phonics analysis, structural analysis, and picture clues are widely used by teachers to teach word

recognition. Nevertheless, the whole word approach is considered to be the most popular technique for teaching these students (Barbetta et al., 1993).

Instructional Strategies

Research on teaching functional sight words/phrases to students with severe disabilities demonstrates that behavioral techniques are effective procedure for teaching these skills. Because students with moderate and severe disabilities require extra teacher assistance when learning a new skill, providing specially designed instructional strategies that provide such assistance is essential. Wolery et al. (1992) indicated that the instructional strategies for these students should be both effective and efficient. Effective instructional strategies provide students with information to perform the required task, thereby maximizing the probability of correct response and increasing student's opportunities to receive reinforcement (Heckaman, 1995). Efficient instructional strategies are those that require the least amount of time and effort to learn a new skill.

To facilitate effectiveness and efficiency, instructional strategies should be designed to ensure that students learn the required task with few errors as well as transfer stimulus control from teacher prompts and cues to the natural task stimulus. The use errorless instructional strategies minimize the potential of reinforcing undesired responses. In such instance, the student may acquire correct discriminations more quickly because there is less chance to make an error. Rhodes (1998) noted that errorless instructional strategies emphasize or exaggerate relevant stimuli in order to increase the probability of correct responses. Mason (1992) reported that the application of errorless teaching strategies is often called errorless stimulus control.

She defined it as a process for developing discriminations with few or no response to the comparison stimuli. This process involves reinforcing a stimulus response that the student already has mastered or can acquire, and gradually changing the stimuli until the desired stimulus-response relation is obtained.

Stimulus control is established by reinforcing task performance in the presence of the task stimulus, and withholding reinformcent if behavior occurs and the stimulus is not present (Fishbach-Goodman, 1996). Behavior that is emitted in the presence of the discriminative stimulus and not in its absence is said to be under stimulus control (Cooper et al, 1987).

Heckaman (1995) reported that the antecedent stimuli represent the condition under which the target behavior is expected to be performed and may include some arrangement of the setting, materials, presentation order of the task materials, and the task instruction. The instructional strategies that are implemented by teachers help students respond correctly, so that these responses can be reinforced. By reinforcing the correct response in the presence of antecedent stimuli and withholding reinformcent for those responses in the absence of these stimuli, the antecedent stimuli obtains control over that response.

The facilitation of the occurrence of stimulus control is obtained by the use of extra-stimulus dimension in the form of verbal instruction, modeling, or physical guidance. This is referred to as response prompting. Response prompts are provided after the natural stimulus, but before any response, to increase the probability that the appropriate behavior will occur. The primary purpose of the prompt is to cause a student to perform a task so that it can be reinforced when the target stimuli is present.

This reinforcement causes the discriminative stimulus relationship between the target stimulus and the task to be learned. This means that a student learns that reinforcement is more probable when the required task is performed in response to the stimuli cue (Wolery et al, 1992). A prompt may be associated with task stimuli, materials, or the response. The prompt is removed or faded, as stimulus control of the response is transferred from the prompt to the discriminative stimulus (Heckaman, 1995).

Students with moderate and severe disabilities often experience difficulty responding appropriately to naturally occurring stimuli in their environment. As a result, they have difficulty learning basic life skills necessary for independent or semi-independent functioning. Therefore, high-level responses may not be in their repertories or may occur infrequently (Rhodes, 1998). Consequently, instructional strategies that teach desired skills to this population necessitate the use of response prompting procedures.

Various response prompting procedures have been used to teach functional sight words/ phrases to student with moderate and severe disabilities. The most commonly used procedures are constant and progressive time delay. Additionally, several studies have examined the use of error correction and simultaneous prompting procedures (Cornner, 1992). As noted by Browder and Xin (1998), in their review on teaching functional sight words, CTD was the most utilized method to teach student with moderate and severe disabilities. They concluded that CTD is more effective as students learn the task with few errors and more efficient in that students master the task with few trials. It can also be delivered by adults, peer, or via computers, and can be used one-to-one or in small group arrangement.

Prior to reviewing specific studies on teaching word recognition to students with moderate and severe disabilities, I first describe each instructional technique, providing information on its general effectiveness for teaching students with moderate and severe disabilities. Then, for each procedure, I provide an example of its application to word recognition as well as how frequently it has been applied by researchers. Next, I review studies on teaching word recognition, to persons with moderate and severe disabilities, and summarize the findings. A total of 29 studies were identified that met the criteria for inclusion in this review. The criterion for inclusion included: word recognition was taught to students with moderate and/or severe disabilities.

Constant Time Delay (CTD). The Constant time delay procedure is considered to be a low-error method of teaching students with moderate and severe disabilities new skills, and is structured to help prevent students from making errors during training sessions. The teacher makes no attempt to reduce the amount of assistance provided across instructional trials. The goal of this procedure is for the student to make the correct response within the time delay interval. CTD was characterized as an instructional strategy where the controlling prompt is faded by inserting a fixed amount of time between the task direction and the prompt. Hence, the CTD procedure not only assists students in making independent responses, but also minimizes student error by waiting for the controlling prompt.

The application of the constant time delay procedure calls for the presentation of a task direction, followed by a delay period of a few seconds, which is in turn followed by an effective controlling prompt that will have enough impact to result in the completion of the behavior by the student. Task direction, refers to something that cues

the students to perform the target skills, whereas the controlling prompt refers to teacher assistance that ensures the student's production of the correct response. The CTD procedure begins by pairing the controlling stimulus with a second stimulus to which control is to be transferred. Rather than fading the controlling prompt, a delay is inserted between the presentation of the new stimulus and the controlling prompt. The CTD delay procedure is seen as a nearly errorless procedure. Rather than having the learner respond incorrectly to the initial task request, it begins with a 0s delay in which the task request is paired with a controlling prompt.

CTD begins with the presentation of a task direction, followed by a delay period of a few seconds, which is then followed by an effective controlling stimulus that is designed to impact the performance of the behavior of the student (Snell, 1993). The controlling stimulus may be a verbal instruction, gesture, or any other appropriate prompt. If the target behavior does not occur within the allocated delay period following the target stimulus, the teacher delivers the prompt. After the prompt is given and the behavior occurs, the student is reinforced. If the behavior occurs during the time delay period, the prompt is withheld and the student is reinforced immediately (Wolery et al, 1992).

Wolery, Holcombe, Cybriwsky, Doyle, Schuster, and Ault (1992) identified 36 studies that used CTD to teach a wide variety of behaviors (e.g., letter recognition, spelling, definition of words, multiplication facts). All of the studies that they reviewed found that CTD was effective. This procedure was found to be effective with students with and without disabilities, ranging in ages from 3 to 31 years. The authors reported that participants were able to imitate, wait for instructional directions, and were able to

identify teachers' reinforcement in a one-on-one or small group situation, for both discrete and chained behaviors. Furthermore, CTD was not only effective when delivered by the teachers in the classroom, but also when delivered by adults and peers via computer tutorials.

The use of CTD in teaching functional sight words/phrases for students with severe disabilities involves following standard procedures except when combining or testing different types of conditions. For example, using CTD to teach the recognition of functional sight words/phrases requires simultaneous presentation of the task stimulus and the controlling prompt in the initial trials. The student is encouraged to say the word, while looking at the target stimulus.

Fourteen studies have implemented CTD procedures when teaching the recognition of functional sight words/phrases to students with moderate and severe disabilities (see Table 1). An example can be found in a study conducted by Alig-Cybriwsky, Wolery, and Gast (1990) who investigated the effectiveness of CTD in teaching expressive identification of functional sight words/phrases to a group of preschoolers with severe disabilities. Participants included three males and one female, ranging in age from 4 years 7 months to 5 years 5 months. Students were enrolled in a preschool/kindergarten classroom that included students with mild and moderate disabilities as well as typical students. Twenty-four unknown words were assigned to the four students. Types of word were not specified. Each student was taught two of the six target words at a time with six trials per word during each session. Instruction began with no delay. After the students responded with 100% accuracy when no delay was given; all subsequent sessions used a 3s-delay interval.

The teacher started the session saying, ("Child's name), What word?" If there was no response within 3s, the teacher modeled the correct response and then waited 3s for a response. Descriptive praise and token reinforcement were provided following correct anticipation and correct waits. Following the nonwait anticipation, wait errors, and no response, the teacher stated "No, the word is___", and waited for a 3s interval before moving on to the next trial. Interfering behaviors were controlled by asking the child to wait his/her turn to talk. After a fourth interference, the child was removed from the group.

Findings from this study indicated that CTD was an effective procedure for teaching functional sight words/phrases recognition to the four preschoolers. For all students, the percentage of correct responses remained at 0% during baseline. The introduction of CTD resulted in the criterion level being reached for all students on all of the target behaviors (100% for 1 session, followed by 95% for 2 consecutive sessions). Generalization was assessed by presenting all words in the study from a worksheet and having each child read them.

Similar results have been obtained in three other studies conducted by Gast, et al. (1990) with 5 middle school age students; Kenneday, Itkonen, and Lindquist (1994) with 3 adults with moderate disabilities; and Schloss, Alper, et al. (1995) with 3 middle school age students. In each of these studies, the procedures used were similar to the ones utilized in the Alig-Cyberwisky et al.(1990) study. CTD procedure began with the presentation of the task, followed by a delay period that varied slightly across studies. 0s second trials were used for the entire first session of instruction in all three studies. The duration of the delay interval across studies ranged from 3s to 4s. The most

frequently used duration was 4s. The three studies provided the five possible responses available in the CTD procedure: unprompted correct, prompted correct, unprompted incorrect, prompted incorrect, and failure to respond. All studies used one consequence (i.e., verbal praise) for unprompted and prompted correct responses. Consequences for unprompted and prompted incorrect responses included verbal feedback (i.e., "No," or "Wait.") followed by error correction. A "no response" was addressed in the same manner as the unprompted and prompted incorrect responses were.

All participants in these studies reached the criterion level of reading all words correctly. Reliability data indicated that teachers implemented all instructional behaviors with a high degree of accuracy (i.e., above 95%). All students learned their target words with an overall error rate of less than 2.5%. However, CTD was found to be ineffective in establishing criterion level performance (i.e., 100%) for one of five students in the study conducted by Gast et al. (1990). In order to assist the students to reach the desired criterion level, Gast and his colleagues implemented several procedural modifications. These modifications included: (a) naming the letters of the word after being modeled by the teacher and before giving the opportunity to read the word, (b) conducting one-on-one instruction while continuing to participate in the group, (c) implementing one word in isolation, and (d) thinning the schedule of reinforcement for group attending.

Researchers have also examined the effectiveness of CTD when older peers have delivered instruction (Koury & Browder, 1986; Schuster, Morse, Griffin, & Wolery, 1996). For example, Koury and Browder (1986) investigated the use of the CTD procedure when students with moderate mental retardation taught five functional

sight words/phrases to six younger peers with mental retardation from a primary-level class. Students ranged in age from six to nine years, and their IQ scores ranged from 37 to 49 (M= 43). The five students who were assigned to participate as peer tutors were selected from an intermediate-level class. Three of tutees were females and two were males. Ages ranged from nine to eleven years, with a mean IQ score was 47 (ranging from 40 to 53). The five peer tutors were randomly assigned to five of the six students, whereas the sixth student received instruction from all peers on a rotating basis. Peer tutors were first taught the unknown five words (bus, cup, girl, go, and key) using the CTD procedure.

All five peer tutors participated in instructional sessions to master both the word list and the teaching procedure. After the peer tutors met the mastery criterion of reading all words correctly, they were taught how to use 0s delay and then a five second delay of the CTD procedure. Students were given the opportunity to tutor each other with these procedures. The peer tutors then used the trial format to teach their younger peers. This format included the cue to read the word, model the prompt, apply the error correction procedure, and correct the tutees when necessary. The teacher implemented a fading schedule, as the tutor used a five second delay after several trials of no delay. Also, when tutees repeated an error, the peer was told to present the prompt again with no delay.

Findings indicated that three of the six students had recognized all five words by the end of the first session of the intervention. The other three reached the criterion level by the end of the third session. The use of CTD and the peer instruction technique positively influenced the acquisition of the target words. Additionally, the use of CTD

procedure enabled peer tutors with moderate mental retardation to provide effective instruction to their peers as well as producing rapid acquisition of all targeted functional sight words/phrases.

A second study by Schuster et al. (1996) assessed the effectiveness of the CTD procedure when peers delivered reinforcement to 3 students with moderate disabilities. In this case, each student was assigned a peer (within the group) to deliver positive reinforcement following each correct response. Two males and one female who attended a self-contained classroom for students with moderate disabilities were assigned to participate in this study. The students' ranged in age from 10 years, 3 months to 11 years, 11 months, and their IQ scores ranged from 40 to 58 (M=49). Thirty-six (36) grocery words were divided into 9 instructional sets with 4 words per set. Each student was presented with four target words, 4 times during a training session, with a total of 16 trials.

The teacher used a 0s delay interval during the initial training session for each instructional word set followed by a 5s delay interval throughout all subsequent training sessions. During the training session, the teacher delivered verbal praise to a student for a correct response, then immediately prompted the assigned peer to deliver additional reinforcement (i.e., token). If the peer student who was assigned to deliver the reinforcement failed to do so, the teacher then presented the verbal prompt to the student.

The results indicated that this CTD procedure was effective in teaching grocery words to students with moderate disabilities. All students achieved the criterion level of 100% accuracy in reading the targeted words across four sessions. In addition, students

acquired the skill of delivering positive peer reinforcement for correct responses. The error percentage was found to be low (2.5%). The error rate when teaching students to deliver peer reinforcement was more efficient with each additional instructional condition. For example, the error rate during the first instructional conditional was 12.2%; the students made 104 errors in delivering reinforcement to their peers. In the second instructional condition, the students responded incorrectly 28 times (3.8%). In the final instructional condition, only 2 (0.1%) errors occurred. The authors suggested that the implementation of this procedure helped the students acquire peer reinforcement skills and produced low rates of error.

Three studies have used CTD procedure to teach students with moderate and severe disabilities how to read product-warning labels (Collins & Griffin, 1996; Collins, Branson, & Hall, 1995; Cuvo & Klat, 1992). The presentation of CTD procedures differed in the two studies conducted by Collins and his colleagues from the one conducted by Cuvo and Klat. Collins and Griffin (1996) and Collins et al. (1995) focused more on teaching students who were severely disabled (mean IQ =43 and 47, respectively) to read key words on product warning labels. The mean age of participants in the two studies was 9.9 and 17 years, respectively. In Collins and Griffin (1996), students were taught to read labels such as liquid bleach, spray oven cleaner, and/or liquid laundry detergent, whereas the subject in Collins et al. (1995) studied warning labels for cooking products.

Words included in the two studies were taught directly from the labels of actual products. Students were required to read all words and respond safely and correctly to product-warning labels. Maintenance and generalization involved a single trial in which

students were given the opportunity to demonstrate a safe motor response in the classroom or home. Students mastered reading all of the target key words when using CTD procedure in a short amount of time with minimal error (less than 2.5% in both studies).

On the other hand, Cuvo and Klat (1992) investigated the effectiveness of teaching six students with moderate disabilities (mean IQ =55) warning and safety signs using the CTD procedure. Nine signs, such as “Not an Exit”, “Garage Sale”, or “Employees only”, were presented on flash cards, videotape and naturally occurring signs. The six students were divided into two groups of three in which each group was taught the same nine signs. Signs in groups of three were taught using each of the three instructional methods.

The use of CTD procedure focused on promoting stimulus control initially to the teacher’s prompt and then transfer control to the words themselves. The teacher used 0s delay for the first training session. He started by pointing to the sign, ensuring that the student oriented to it, and said, “What does the sign say?” He immediately presented the verbal prompt by stating aloud what the sign said. Then he asked, “What would you do if you saw that sign?” This was followed immediately by verbal prompt, with the teacher stating aloud what to do when seeing the sign. During the second and subsequent trials, the teacher initiated the same procedure, but with 4-s delay before providing the verbal prompt.

The results indicated that the students were able to acquire all warning label words and phrases regardless of the instructional method used. The words were learned in six or fewer sessions, with a minimal number of errors and in a short period of time.

Acquired response in the flash card and videotape conditions generalized to the community setting with 100% correct responding. The results showed that the participants were responding to the textual cues on the signs during the community test as opposed to irrelevant cues in the community.

Researchers have compared the use of CTD procedures to other instructional procedures when teaching functional sight words/phrases to students with moderate and severe disabilities. These include comparison with progressive time delay (Ault, Gast, & Wolery, 1988), system of least to most (Doyle, Wolery, Gast, Ault, & Wiley, 1990; Gast, Ault, Wolery, Doyle, & Belanger, 1988), stimulus modification procedures and feedback (Lalli & Browder, 1993), and simultaneous prompting (Schuster, Griffen, & Wolery, 1992).

All 5 of these studies used direct comparison to identify the relative efficiency of CTD procedure and other instructional strategies. Researchers have compared the efficiency of CTD and other strategies in terms of the number of trials, errors, percent of errors, and minutes of instructional time as well as the effectiveness of CTD procedures and the other strategies for fostering maintenance and generalization across investigators and stimulus. For example, Ault, Gast, and Wolery (1988) compared the effectiveness and efficiency of CTD and progressive time delay (PTD) procedures in teaching community sign words to three students with moderate and severe mental retardation. Each student was taught to read 12 functional community-sign words (e.g., out, enter, stop, exit, girls, boys), 6 with progressive time delay and 6 with constant time delay. The 12 words were taught in intermix fashion (i.e., 2 words at the same time) to ensure a conditional discrimination.

The first session began with the teacher presenting a card with the word phrase printed on it. The teacher delivered an attending cue “Child name, look,” to ensure an attending response, and presented the task direction “What word?” followed by an immediate delivery of the control prompt (a verbal model of the correct response). In each subsequent session, the delay time was increased by 1s increments (i.e., 1s in session 2; 2s in session 3, 3s in session 4) to a maximum of 8s. The delay interval remained at 8s until the student reached criterion level responding. Descriptive praise and token reinforcement were delivered following prompted and unprompted correct responses. The prompted or unprompted incorrect response in addition to no response were followed by the teacher saying “No”, removing the word card, then looking away from the student for 10s.

CTD procedure began with the 0 delay trial, pairing the discriminative stimuli with the controlling prompt. Instead of progressively increasing the delay between the presentation of the stimulus and the delivery of the controlling prompt, a fixed prompt delay was used (e.g., 4 second). As the students began to anticipate the prompt, the stimulus control was transferred to the discriminative stimuli. The study found that both procedures were effective and there was a minimal difference on efficiency measures. CTD and (PTD) accelerated the reading of sign words to criterion levels, and these gain were maintained across probe conditions. The error percentage was low in both procedures (a mean of 0.5% across all pairs of sign words). Maintenance measures showed that all participants in both procedures maintained 100% correct responding, except for two sessions with two students. Also, all participants generalized the target

words with 100% correct responding from the printed word to the actual photographs of the community signs.

In addition to perceiving simultaneous prompting as a systematic form of the antecedent prompt and test procedure, it has been viewed as one component of the time delay procedure (i.e., the initial 0s second delay) (Singleton, Schuster, & Ault, 1995). However, little has been done to compare its efficiency and effectiveness to either CTD or PTD. Only one study was found that compared simultaneous prompting to CTD in the teaching of word recognition. Schuster, Griffin, and Wolery (1992) compared the two procedures to determine whether a simultaneous prompting procedure would be as effective as CTD when teaching functional sight words/phrases reading to four students with moderate mental retardation. Eighteen words were assigned to six instructional sets: three words per set, three sets per instructional procedure. Each student was required to acquire three word sets (e.g., nine words) with each procedure.

Participants received instructional sessions every day for a total of 15 trials for each technique. Use of the simultaneous prompting procedure in teaching the functional sight words/phrases involved the presentation of each word card followed by an immediate correct response. The student's correct response, which involved repeating the model within 4-seconds, was praised. An incorrect response by the student resulted in the teacher repeating the model. After delivery of the consequence, the teacher waited for a 1-3 second interval before presentation of the next word. The teacher provided a daily presentation of the procedures until the student reached the criterion level on that word set.

CTD started with a 0s time delay, as the teacher presented the flashcard followed by an immediate model of the correct response. A four-second delay was used through all subsequent sessions. All correct responses, correct anticipation and correct wait, resulted in verbal praise delivered by the teacher. The teacher stated the correct word whenever the student read the word incorrectly (prior to the prompt) or incorrectly read the word within the 4-seconds delay interval. Just as with the simultaneous prompting procedure, the teacher waited for a 1-3 second interval prior to the presentation of the next flashcard. The daily presentation of the procedure was continued until the student reached the criterion level (i.e., 100% correct for two consecutive days).

Findings indicated that the difference between the two procedures across all students and sets minimally favored the simultaneous prompting procedure. The simultaneous prompting procedure required fewer sessions, less direct instructional time, and resulted in fewer errors through criterion. A total of 13 fewer training sessions and approximately 16 fewer minutes of direct instructional time were required when using the simultaneous prompting procedure. Error percentage across all students was higher when using CTD (2.9%) compared to one training error (0.1%) across all students who received the simultaneous prompting procedure.

Maintenance data were collected 2, 4, and 8 weeks after training. No significant differences were found between the two procedures with regard to the maintenance data. The simultaneous prompting procedure produced a higher level of maintenance for two students, while CTD resulted in better maintenance for the other two students.

In summary, fourteen studies have implemented CTD procedures when teaching the recognition of functional sight words/phrases to students with moderate and severe disabilities. Results of these studies indicated that the CTD procedure was effective in teaching product-warning labels, grocery and academic words to students in preschool, elementary, middle and high school with moderate and severe disabilities. This procedure was also shown to be effective when older peers delivered instruction (Koury & Browder, 1986) and when a peer was assigned to deliver positive reinforcement following each correct response (Schuster, et al, 1996).

Most of the reviewed studies (60%) were conducted using one-to-one arrangements within the school setting. However, there is a growing number of research literature on delivering such instruction to small group of students. All studies that utilized small group procedures employed a one-to-one arrangement during the probe sessions (Gast et al 1990). Basically, the one-to-one arrangement appeared to be more frequently used than small group instruction.

The effectiveness of the CTD procedure and outcome measures were computed for all studies. The acquisition of functional sight words/phrases when using the CTD procedure appeared to reach 100% accuracy in 10 out of the 14 reviewed studies. Three of the four remaining studies (Collins et al, 1995; Collins & Griffen, 1996; Gast et al, 1988) were considered to be very effective and the acquisition of functional sight words/phrases remained above the 80% level. Only Lalli and Browder (1993) showed a low percentage (75%) of acquiring targeted words. In this study, CTD was compared with three other procedures (stimulus fading, stimulus shaping, and feedback) to identify the most effective and efficient procedure. The findings from this study should

be interpreted with caution because of following procedural variation. For example, the investigators' manipulated the target stimulus in the stimulus fading procedure and the distractor stimuli in the stimulus shaping procedure. In addition, implementation of four procedures in teaching a small number of students (n = 3) at the same time may reduce the probability of a higher percentage of treatment integrity. Therefore, it is not surprising that the acquisition of functional sight words/phrases was not as efficient in this investigation as was in the previously reviewed studies.

Several measures of efficiency were reported in the reviewed studies. Many of these studies reported the mean number of errors made by studies (64%), number of sessions (57%), minutes of instruction (57%), and number of trials (50%). The range of error has been reported as less than 1% to 10%. The instructional time (minutes) needed to reach criterion with subsequent word sets decreased in many studies. Gast et al. (1990) for example, indicated that the total amount of instructional time decreased from 5 hours, 42 minutes when teaching word set 1 to 2 hours, 55 minutes by word set 3.

Although the effectiveness of the CTD procedure was established in most of the studies, some of the investigators implemented several procedural modifications to ensure that students reached the desired criterion level. Doyle et al (1990) added a specific attention cue (i.e., students were prompted to look at the word), whereas Gast et al. (1990) used additional techniques to help one student reach the same criterion level as other students in his group.

When the use of CTD procedure is compared to other instructional methods for teaching functional sight words/phrases recognition, results showed that CTD procedure

was slightly more effective than PTD (Ault, et al, 1988). However, when CTD was compared to simultaneous prompting, results favored simultaneous prompting, which required fewer sessions, less direct instructional time, and resulted in fewer errors throughout criterion (Schuster et al 1992).

Only three studies reported lacked maintenance data (Collins et al, 1995; Gast et al, 1990; Kennedy et al, 1994). The implementation of maintenance was obtained through the use of review trials and the thinning of the reinforcement from a CRF to a VR3 schedule. Follow-up maintenance was assessed in most of the studies. The length of maintenance varied from 1 week (Gast et al, 1988), to 7 months (Lalli & Browder, 1993).

Generalization was assessed in 8 studies and included generalization across materials (Collins & Griffen, 1996), settings (Ault et al, 1988), and persons (Cuvo & Klat, 1992). Only one study reported 100% accuracy when generalizing targeted functional sight words/phrases (Gast et al, 1988). The lowest percentage of generalization procedure was reported by Schuster et al. (1996) where students obtained 53% correct responses of their peer's assigned words.

Progressive Time Delay (PTD). The only difference between PTD and CTD is that the delay period in PTD gradually increases between the initial task direction and the teacher prompt. PTD requires the teacher to use progressive delay by introducing the 0s-delay trial, followed by several 1s delays, then by several 2s delays, and so forth. The time between the task direction and presentation of the controlling prompt gradually increases over trials or blocks rather than remaining constant across trials

(Fishbach-Goodman, 1996). Varying delay intervals can also be incorporated in the procedure, following the initial 0s delay interval.

Fishbach-Goodman (1996) reported that progressive time delay might not be as parsimonious as constant time delay. They argued that the delay interval must be gradually increased over trials, whereas with constant time delay the prompt delay interval is increased from a 0s delay to a fixed interval. Also progressive time delay may be more difficult to implement, given that the delay intervals change on each trials rather than in each session.

Considerable evidence exists showing that PTD is one of the most effective and efficient instructional strategies available to teach functional sight words/phrases to students with moderate and severe disabilities. Researchers have found PTD to be effective in teaching a variety of functional sight words/phrases, including functional words (Browder, Hines, McCarthy, & Fees, 1984), product warning labels (Collins & Stinson, 1995), grocery words (Doyle, et al., 1996), common reading words (Farmer, et al., 1991), matching printed words to their dictated names (Glat, Gould, & Stoddard, 1994); community words (Stinson, Gast, Wolery, & Collins, 1991), and photograph identification (Wolery, Doyle, et al, 1991).

Seven studies have examined the effectiveness of PTD procedure in teaching word recognition to students with moderate and severe disabilities. Three of these studies have used PTD to teach young students functional sight words/phrases recognition (Doyle et al., 1996; Stinson et al., 1991; and Wolery, Doyle, et al., 1991). Two of the remaining four studies examined the effectiveness of PTD with older students (Collins and Stinson, 1995; and Farmer et al., 1991), whereas the other two

studies (Browder et al., 1984; and Glat et al., 1994) utilized PTD procedure to teach functional sight words/phrases recognition to adults with moderate and severe disabilities. Table 2 provides information of all studies that used PTD to teach functional sight words/phrases recognition to persons with moderate and severe disabilities.

The age of students in all three studies that involved younger students ranged from 7 to 13 years with an IQ ranging from 37 to 51. The introduction of PTD procedures in each study was similar in that the teacher presented the targeted words and attendant cues, the discriminative stimulus, and the controlling prompt. All three studies used two types of correct student responses (unprompted correct and prompted correct). Following each correct response, teachers delivered a descriptive praise statement (e.g.“good job”). In each study, the teachers monitored three types of incorrect responses: unprompted error, prompted error and no response. The desired criterion level in each study was set at 100% correct unprompted response.

The delay interval in all three studies began with 0s and increased to a maximum of 6-s (Wolery, Doyle, et al., 1991). The only difference between these three studies was that they examined different types of functional sight words/phrases. For example, Doyle et al. (1996) used the PTD procedure to teach grocery words, whereas Stinson et al.(1991) used PTD to teach community words. In contrast, Wolery, Doyle et al. (1991) used photograph identification to teach functional sight words/phrases to younger students. In each of these three studies (Doyle et al., 1996; Stinson et al., 1991; Wolery, Doyle et al., 1991) provided a successful procedure for teaching functional sight words/phrases to young children with moderate and severe disabilities.

In the study by Doyle et al. (1996), for example, children with severe disabilities were taught to label photographs of grocery items that had been selected by the students' parents. The students, two males and two females, ranged in age from 7 to 9 years; their IQ score ranged from 37 to 51. All four students attended self-contained classrooms for students with moderate disabilities in a public elementary school. Twenty-six food items that the students' families purchased and consumed in the home were selected as target stimuli. The targeted words were divided into four instructional sets. The PTD procedure was used to teach each student words from the dairy (e.g., sour cream), frozen food (e.g., spinach), and meat (e.g., turkey) sections of the grocery store. The delay interval began with 0s and increased in 1s increments across subsequent sessions to a maximum of 4s.

Generalization was assessed during a trip to the local grocery store, where students were required to identify the foods from the dairy, frozen food, and meat departments in each set. The teacher guided the students through the store while they looked at the items on their shopping list. The teacher randomly stopped, pointed to an item and asked; "What food is this?" and waited 4s for a response. Praise for attention and cooperation was delivered by the teacher to students on the average of every third trial (e.g., VR3 schedule).

Although students lacked experience with these tasks, which often required extensive procedure modification for acquisition to occur, all students (except one who moved before the introduction of the last two sets of words) learned all targeted grocery words. In addition, all students were able to correctly identify and name the actual foods found in the supermarket. Percent of generalization across the four students for

the photograph sets was 100% for the meat department, 57% for the dairy department, and 29% for the frozen food department.

Collins and Stinson (1995), as well as Farmer et al. (1991) used the PTD procedure to teach functional sight words/phrases to older students with disabilities. For example, Collins and his colleague Stinson used flash cards and the PTD procedure to teach four students with moderate mental retardation how to read product-warning labels (i.e., caution, harmful). Students ranged in age from 16 to 20, with IQs ranging from 40 to 63: students were taught in dyads, and for each dyad a set of 12 words was selected for instruction. One half of these words were taught to one student; the other half to the second student. For all students, the response interval began at 0s and increased in 1-s increments across subsequent sessions to a maximum of 5s. The teacher delivered praise on a continuous reinforcement (CRF) schedule for correct identification of targeted words. The reinforcement was then thinned to a VR3 schedule for the last two sessions of the instruction.

The teacher conducted generalization during this study in one-on-one probe sessions using actual household products. These generalization probes were instituted prior to the first probe condition, following the final probe condition, and two weeks after the final probe condition to assess generalization across settings as well as maintenance. Students were taken to a local grocery store and asked to read words on the warning labels of products selected randomly by the teacher.

The authors found that the PTD procedure was effective in teaching functional sight words/phrases to students with moderate and severe disabilities. The words presented on flash cards were mastered in a short amount of time with a very low error

rate (not more than 2%). The authors also reported that students were able to read words on labels, but this skill cannot be considered sufficiently useful until students can demonstrate that they know the meaning of the word. Just being able to read a word such as “poison” on a label, does not insure that students will understand that the contents labeled could be harmful.

The other study that taught functional sight words/phrases to the older students with moderate disabilities was conducted by Farmer et al. (1991). They used the PTD procedure to teach high school students with severe disabilities read community-referenced words (i.e. restroom, Big Mac, chicken). The four students who participated in this study ranged in age from 15 to 19 years of age. Their IQ scores, however, were not reported. A total of 32 words were selected by the teacher based on their perceived frequency of occurrence in the students’ environment. Each student was taught 3 different word sets, one pair at a time per instructional condition. The PTD procedure began with the teacher presenting the attentional cue, stating the task instruction and delivering the controlling prompt. Instruction for each pair of words began at 0s and increased by 1-s increments to a maximum of 5s. The desired criterion for successful completion of instruction required that the student respond with: (1) 100% unprompted response over two consecutive sessions when reinforced on a CRF schedule., and (2) 100% unprompted correct responses for two consecutive sessions using a VR3 schedule.

The findings from this study illustrated that the PTD procedure can be effectively taught in small group instructional arrangements. Prior to the implementation of the PTD procedure, community-referenced target words for all

students were at 0s percent correct. The percentage of correct responses after implementing the PTD procedure rose to criterion level (100% correct) for all students. The PTD procedure proved to be a near errorless method for all students. The four students averaged a 2% error rate. For the total group of participants, the percentage of errors decreased after each implementation of the PTD procedure.

The two studies that used the PTD to teach functional sight words/phrases (Browder, et al., 1984; and Glat, et al., 1994) to adults differed in terms of the number of participants and the methods for implementation PTD. While Browder et al. (1984) used the PTD procedure to teach functional sight words/phrases and their corresponding functional activities to eight adults with moderate mental retardation, Glat et al. (1994) used the PTD procedure to teach participants to match printed words to their dictated names.

Participants in the Browder study ranged in age from 24 to 40 years of age, with IQs ranging from 31 to 62. Twelve functional sight words/phrases (i.e., cooking, telephone, laundry) were selected from the students' community environment. The PTD procedure involved the teacher immediately modeling the correct response (0s delay) on the first trial, and then increasing the interval delay by 2-s on progressive trials to a maximum of 8-s.

The use of this procedure resulted in all participants reaching the desired criterion level (100% unprompted correct) on all twelve words after the implementation of the instruction. This procedure showed that cooking and telephone words were acquired after instruction. Learning those twelve words surpassed each subject's total functional sight words/phrases acquired to date even after years of instruction.

On the other hand, the study conducted by Glat, et al. (1994) implemented three different experiments with one subject. Glat and his colleagues were interested in teaching conditional discrimination to an individual with moderate mental retardation. The subject was a 25-year-old male who was diagnosed with congenital hydrocephaly; no data on intelligence was provided. The task in each experiment involved matching printed word comparison stimuli to dictated name sample stimuli. Printed words such as "boy" and "hat", "bus" and "pen", and "bat" and "dog" and their dictated names were taught by using the PTD procedure. In these experiments the subject waited for the delayed cues unless differential responses to the dictated samples were required.

The researchers indicated that the attempt to use the PTD procedure to teach conditional discrimination was unsuccessful. One explanation for the failure of the stimulus control transfer may be because the subject ignored the new stimulus and only responded to the delayed cues, which included visual stimulus. The appearance of the PTD procedure with delayed cues reinforced the behavior that occurred prior to it. When the delay was short (i.e., 0 seconds), the behavior was likely to be a continuation of interval behavior. As the delay was lengthened in small increments (i.e., 1 second intervals) prolongation of waiting was gradually shaped.

In summary, the PTD procedure is an effective procedure fro teaching functional sight words/phrases to students with moderate and severe disabilities. All reviewed studies indicated that CTD was effective when used with young students (Doyle et al., 1996; Stinson et al., 1991; and Wolery, Doyle, et al., 1991), older students (Collins and Stinson, 1995; and Farmer et al., 1991), and adults with moderate and severe disabilities (Browder et al., 1984; and Glat et al., 1994). Fishbach-Goodman (1996) further

reported that PTD was effective when used to in teach a variety of functional sight words/phrases, including functional words, product warning labels, grocery words, common reading words, community words, and photograph identification.

Error Correction. Error correction is a strategy used to minimize potential errors. Following an error, the student is provided with information on how to respond, which may involve verbal instruction, a model, a gesture cue, and partial or full physical assistance. Thus, the student is given another immediate opportunity to respond independently (Snell, 1993). Error correction has been defined by Johnson, Schuster and Bell (1996) as, "a prompting procedure in which the prompt is delivered contingent on the production of an error" (p. 439). This procedure communicates that a response is incorrect and also provides a model on how to produce the correct response. In this way, the teacher gives the student the opportunity to correct the response (Wolery et al, 1992).

Error correction has been shown to be effective because it: (a) is applied immediately and consistently, (b) provides help to correct the error quickly, (c) provides an increased amount of assistance and reinforcement, (d) is followed by additional opportunities to respond to the same behavior, and (e) increases independence (Snell, 1993). It is important that the acknowledgment of an error is not followed by negative or harsh feedback. To be effective, error correction must be made obvious to the student by the teacher verbally labeling incorrect responses, providing assistance to help the student get information on how to perform the task, and having the student participate in correcting his/her error.

Only one study has examined error correction in teaching word recognition to students with moderate or severe disabilities (Table. 3). Browder and Shear (1996) utilized error correction in an intersperal treatment to teach functional sight words/phrases for reading the daily newspaper weather report to three students with moderate mental retardation. The three students ranged in age from 12 to 16, with IQs ranging from 40 to 45. The words taught were selected from the general education and language arts curriculum that the students attended as part of the daily instruction. The goal of this study was to teach students to recognize weather words, read the weather report form the newspaper, and be able to determine what clothing was needed for community-based instruction (e.g., umbrella, sweater).

During the daily intervention, the teacher tested each student on 10 words, implemented the interspersal drill, used a story starter to teach phrase reading, and then ended the session with a generalization probe to read an actual newspaper story. The error correction procedure was used for incorrect or no response after 3s of delivering the task direction. The teacher used five steps to correct the student response. Three of these started with the teacher saying the word correctly, and then asking the student to repeat the model while looking at the word. Third, the teacher asked the student to trace each letter while spelling the word aloud. Fourth, the teacher put the word in a sentence and stated the word. Finally, the teacher asked the student to read the word while looking at it. The use of the immediate error correction procedure resulted in all three students learning all 10 new words in about 2 to 6 weeks.

The overall error response was 2% to 4%. Although this error percentage was low, it can't be considered as an errorless procedure, such as time delay, because it

utilized post-response prompting rather than pre-response prompting. However, the authors reported that the error correction procedure used in the interspersal treatment package helped to maintain the rapid pace of the drill (i.e., minimum teacher talk, unless an error was made by the student). Generalization was assessed by timing the student when a reading weather report in the daily newspaper. The generalization criterion was obtained by the student reading 10-12 words correct in a minute. Unfortunately, findings from the generalization probe were ambiguous. Students obtained some progress in reading a passage from a newspaper, but failed to reach criterion level.

Simultaneous Prompting. Wolery et al. (1992) identified simultaneous prompting as an effective instructional procedure for teaching functional sight words/phrases to student with severe disabilities. Simultaneous prompting is viewed as a systematic form of the antecedent prompt and test procedure. The two procedures are similar in that 0s delay trials are used throughout all training sessions. Then daily probe sessions are conducted to determine if the student is able to respond to the discriminative stimulus in the absence of the prompt. The two methods differ, however, in the use of the controlling prompt and the occurrence of probe trials. The simultaneous prompting procedure always employs controlling prompts throughout training sessions, whereas antecedent prompt and test procedures have not necessarily employed controlling prompts (Gibson, 1991). The probe sessions are always conducted just before training trials when using simultaneous prompting procedures, permitting probe trials to occur at any time in relation to training trials (e.g., immediately after training trials, three hours after training trials, the next day, etc.) (Singleton, Schuster, Morse, Collins, 1999).

The simultaneous prompting procedure is described as a near-errorless instructional procedure in that both the controlling prompt and the discriminative stimulus are presented at the same time. Wolery et al. (1992) reported that simultaneous procedure is an uncomplicated procedure, as the teacher presents a target stimulus such as a word or picture, followed by the presentation of a controlling prompt (e.g., the correct word or the name of the picture). Several aspects of the simultaneous prompting procedure are preferable to other response prompting procedures because they: (a) require no change in the teachers' behavior during training (e.g., no implementation of hierarchy prompting system), (b) require no student prerequisite skills (e.g., wait response skills in time delay), (c) reduce instructional time, (d) reduce the number of training errors, (e) produce a rapid acquisition of target skills, and (g) provide a high degree of reinforcement.

Two studies have been conducted that utilized the simultaneous prompting procedure to teach students with moderate and severe disabilities to read functional sight words/phrases (see Table. 3). Singleton et al. (1999) have compared the simultaneous procedure to the antecedent prompt and test procedure, whereas the other study (Singleton, Schuster, and Ault, 1995) used this same simultaneous method to teach expressive identification of photographs of community signs to elementary students with moderate disabilities. Singleton et al. (1999) compared the two procedures to determine which one was more efficient in the acquisition, maintenance, and generalization of the target behavior. Participants included of three males and one female with moderate disabilities who attended a self-contained classroom and received community-based instruction. Participants ranged in age from 15 to 17; IQs ranged

from 57 to 58. A total of 27 grocery words for each student was identified and then divided into three target word sets. The teacher used an antecedent prompt and test procedure to teach one of the 3-word subsets, whereas simultaneous prompting was used to teach the other three-word subset. The third subset was used with a control group.

The teacher started the training session by delivering an attentional cue: ("Child's name"), "Are you ready to read words?." Next, the teacher presented an index card with the grocery word on it, saying "What word?" followed by an immediate controlling prompt (i.e., the teacher says the word). The teacher waited 5seconds before delivering the descriptive verbal praises for the correct response. If the student's response was incorrect, the teacher stated "No. This word is___" and asked the student to say the word.

The teacher assessed maintenance one-day after reaching criterion and 1, 4, 10, and 16 weeks thereafter. The teacher asked the student to read a newspaper advertisement, handwritten grocery list, and grocery items in an actual store to assess generalization. The students learned all target words when taught by either procedure. Nevertheless, the antecedent prompt and test procedure was more effective on measures of acquisition (i.e., less instructional time, fewer sessions, and fewer errors). Students were able to generalize their ability to read the grocery functional sight words/phrases across materials, people, and settings.

The other study conducted by Singleton et al. (1995) examined the effectiveness of the simultaneous procedure with a dyadic group of students with moderate disabilities. Two students, aged 7 and 11 years, with IQs of 42 and 40, respectively,

were enrolled in this study. Both students were exposed to twenty community signs (i.e. wet paint, restroom, phone and quiet) that were divided into ten sets containing two signs each.

Each student was taught one sign set at a time and neither of them had the same signs. The students received four trials per targeted sign, for a total of 16 trials during the instructional sessions. Trials were placed in chronological order so that no student had more than two consecutive trials and no sign was shown to a student on more than two consecutive trials. With an incorrect response or no response at all from the student within a 5s interval, the teacher repeated the prompt and directed the student to repeat the word. Following each correct response and depending upon their behavior, the students were asked to choose their reinforcers from a variety of items (i.e. candy, stickers, and toys).

Maintenance was conducted 7 and 14 days after the end of the last session. Generalization was assessed individually during pre-test and post-test of the actual signs found during community-based instruction. Results indicated that the two students responded to the targeted signs with a mean of approximately 89% accuracy during both 7 and 14-day maintenance probe sessions. Data indicated that both students generalized the acquired skills to the natural community setting with at least 75% accuracy. Overall, the use of the simultaneous prompting procedure within a dyadic group format was effective in teaching expressive identification of photographs of community signs.

In summary, the simultaneous prompting procedure has been described as an uncomplicated procedure in which the teacher presents a functional sight words/phrases

followed by the presentation of the controlling prompt. This procedure has been shown to be effective when teaching functional sight words/phrases to students with moderate and severe disabilities. Researchers such as Singleton et al. (1999) indicated that this procedure is more efficient in the acquisition, maintenance and generalization of teaching grocery words than the antecedent prompt and test procedure. Additionally, another study conducted by Singleton et al (1995) found that simultaneous prompting procedure within a dyadic group instructional format proved to be very effective in teaching expressive identification of photographs of community signs.

Incidental Learning

Recently, researchers have focused their investigations on the impact of adding extra information to the primary target behavior being taught. They have sought to determine whether students learn this extra information along with the target behavior targeted for instruction. According to Wolery (1992), the presentation of the extra information, or non-target behaviors, can be utilized in two places within the instructional process: 1) prior to the instructional trials or during the attentional cues, and 2) after the student's response or during the subsequent events. Incidental learning is the acquisition of non-target behavior that can be learned during the antecedent or consequence portion of the instructional trials (Singleton, Schuster, & Ault, 1996). In other words, the teacher adds additional related materials to an instructional session when using direct instruction to teach students with disabilities. The teacher assists students to learn both the target and non-target behavior, but rewards them for only responding to the target behaviors (Stevenson, 1972).

The non-target behaviors selected should be developmentally appropriate for the

child. It is important that such behaviors are consistent with the student's IEP goals or the curriculum standards of his/her school district. Werts et al. (1991) reported that teachers should identify the non-target behaviors that need to be learned, select an instructional technique (e.g., constant time delay, least to most), and identify a time and format for teaching. The additional information should be related in some way to the targeted task (i.e., functional sight words/phrases and spelling, coins and their values, shapes and colors), as well as be interesting and motivating to the child.

Incidental learning can be achieved orally or visually; orally through manual signs and/or speech, and visually through pictures, or flash cards. The two methods can be used together to teach non-target behaviors. However, the presentation of incidental learning techniques should take into account students' characteristics as well as characteristics of the stimuli. For example, students with visual disabilities may need flash cards with large bold type. A computer may be most appropriate with students who have physical disabilities. Additionally, materials and information may direct the teacher's decision regarding presentation. For instance, the use of color requires a visual presentation and the use of words on a flash card, a verbal presentation (Wolery et al, 1992).

An important step in functioning independently in the community is the ability to read words and comprehend their meaning (Wolery et al., 1992). Not surprisingly, therefore, researchers have often included word definitions as non-targeted information in studies of word recognition (Collins et al., 1995; Gast et al., 1990; Singleton et al., 1995; and Stinson et al., 1991).

In all four studies completed to date, definition of words was inserted after the

descriptive praise statement for learning the targeted functional sight words/phrases. Following the unprompted and prompted correct response of a functional sight words/phrases, the teacher delivered the praise and stated the definition of the word (i.e., “Good job”, Bakery means where you buy cake”). Children in three of the four studies (Gast et al., 1990; Singleton et al., 1995; and Stinson et al., 1991) were elementary school-age students ranging in age from 7 to 11. Their IQs ranged from 33 to 51. In contrast, Collins et al. (1995) conducted a study with older students who were 16 to 18 years old, with IQ ranging from 36 to 50. In all four studies, generalization of word definitions was assessed in a one-to-one format prior to the implementation of the study and following the final probe condition of the study.

Collins et al. (1995) studied warning labels for cooking products. Words were taught directly from the labels of actual products to four students with moderate disabilities. Participants ranged in age from 16 to 18 with IQs ranging from 36 to 50. They were required to read all words and respond correctly and appropriately to product-warning labels. Definitions of the identified key words were presented by peers in the feedback statements and inserted as part of the descriptive praise statements during the CTD procedure when cooking activities were taught. Prior to the implementation of instruction, the teacher taught peer tutors how to conduct probe and instructional sessions, collect and graph data as well as how to deliver the definitions of words following verbal praise for correct responses. Peer tutors were taught by the teacher to praise correct responses and state the non-target information (“What does the word ___ mean?”).

Findings indicated that exposing students to the definitions of target words during instructional feedback statements appeared to be effective in increasing the student's ability to define words during cooking activities. The acquisition of definitions of target words increased during the final probe for all students. The percentage of correct responses to definitions during the final probe ranged from 79% to 100% for all students. Generalization of definitions was assessed by the investigator in a one-to-one format prior to the first probe condition, and following the final probe condition. Using a novel a novel brand during cooking activities. Results of pre- to post intervention showed that the mean percentage of generalization of word definition had increased substantially from 12% to 100% for all students.

The definitions of 40 environmental functional sight words/phrases was examined by Gast et al. (1990) with incidental learning by five students with severe disabilities who ranged in age from 8 to 11 years, with IQs ranging from 33 to 48. The assigned words were divided into four sets in which each student learned eight different words. During the probe sessions, students were assessed on their acquisition of functional sight words/phrases definitions. During probe I, the teacher assessed all 40 words. Beginning with probe number two, the only word definitions assessed were those presented previously (e.g., pair 1) and those that were to be presented (e.g., pair 2). Each student was tested on the definitions of his/her assigned words as well as the definitions of words for the other members of the group. During instruction, the definitions were provided as part of the descriptive praise statements. The teacher followed the descriptive praise statement by repeating the word name, and then the definition of the word (e.g., "Exit means to go out").

The presentation of the definition of words in the descriptive statement following correct responses resulted in students learning about one-third of the target words. Learning the definition of words occurred in a relatively equal manner across target words and words taught through observational learning. The authors believed that to the low percentage of correct responses on word definition was due to the difficulty of the target task (i.e., students did not know the referents or word meanings for the functional sight words/phrases).

In the functional sight words/phrases study by Singleton et al. (1995) non-targeted information for each sign taught was a predetermined word or a statement describing what the sign meant, what action to take, or what items were found. The focus of this study was to examine the effectiveness of the simultaneous presentation of targeted and non-targeted information with a dyadic group of students with moderate disabilities. Two students, aged 7 and 11 years, with IQs of 42 and 40, respectively, participated in this study. Incidental learning involved mastering the definitions of 20 community signs that were selected through a parental questionnaire. Incidental learning was assessed 30 minutes after each full instructional session. Procedures for assessing incidental learning were the same as baseline probes, except that the task direction was “What does this sign mean?”.

During the delivery of instruction, definitions of the signs were inserted after the descriptive verbal statement for the targeted information. When the student responded correctly to the task direction for the target information, the teacher responded with praise paired with the definition of the statement (e.g., Good job! Exit means go out”). Maintenance was assessed 7 and 14 days after criterion was reached for the two

students. Generalization was conducted individually during pretest and posttest of the actual signs found in the environment during community-based instruction.

Data indicated that the two students acquire some non-target information associated with the signs they learned. The mean percent correct of incidental learning during instruction was about 60%. Both students maintained 70% accuracy for the definition of their target words. Pretest data of generalization indicated that no student correctly identified the non-target information before instruction. However, posttest data revealed that both students were able to define their target words with 68.8% accuracy.

Stinson et al. (1991) presented the definitions of target words incidentally in the consequence statement. The authors implemented a PTD procedure to teach functional sight words/phrases to four elementary school-age students with moderate mental retardation to read target functional sight words/phrases. The four students ranged in age from 9 to 10 years, with IQs ranging from 40 to 51. Students were taught in a dyad arrangement to increase the number of words acquired and defined by each student. Each of the 16 selected words was tested with students to ensure that they had 0s correct responses on all words and their definitions. Definitions of words were inserted after the descriptive praise statement. Following the unprompted and prompted correct responses, the teacher delivered the praise and stated the definition of word (i.e., “Good job, “Bakery means where you buy cake”). Maintenance and generalization were assessed through individual probe sessions. Students were asked to read and define the words one week following the completion of instruction.

Findings on incidental learning of word definitions indicated that three of the four students acquired at least 50% of the target word definitions and 50% or more of observational word definitions (words taught to the other member in the dyad). The overall mean for acquisition of target word definition was 84.4% and 73.5% for acquisition of observational word definition. Correct generalization of word definition was 78.13% and observational learning of words reached 50.13% for all students. The authors concluded that adding a word definition trial sequence resulted in students acquiring more information and skills than those targeted, which positively increased the instructional efficiency.

Three studies have found that when photographs of functional sight words/phrases have been presented as non-targeted information in functional sight words/phrases recognition studies, students with moderate and severe disabilities have learned between 25% to 100% of these non-targeted stimuli (Doyle et al., 1996; Griffen et al., 1998, and Wolery et al., 1991). Photographs that were used in the three available studies focused on either foods or occupations. Doyle et al. (1996), for example, paired pictures of food with their corresponding functional sight words/phrases, whereas in the other two studies (Griffin e al., 1998; Wolery et al., 1991) pictures of occupations found in the community were paired with their corresponding functional sight words/phrases.

Doyle et al. (1996) used progressive time delay to examine the acquisition of target and non-target stimuli for four students with moderate mental retardation. The students, two males and two females ranged in age from 7 to 9 years with IQs ranging from 37 to 51. All students enrolled were taught in self-contained classrooms for

students with moderate disabilities in a public elementary school. Twenty-six food items that the students' families purchased and consumed in the home were selected as target stimuli. The targeted words were divided into four instructional sets. The PTD procedure was used to teach each student the sets of food from the dairy (e.g., sour cream), frozen food (e.g., spinach), and meat (e.g., turkey). The delay interval began with 0s and increased in 1s increments across subsequent sessions to a maximum of 4s.

In addition to naming the photographs of food as target stimuli, students were assessed in the grocery department at a local supermarket where food could be found as non-target stimulus. Incidental learning was assessed in a pretest/posttest format. Students were given the 12 target photographs and asked to name the department from which they came (i.e., dairy, meat, or frozen food department). Posttest included a presentation of five distractor food photographs that included both known and unknown items that were selected from all departments.

Results of the pretest and posttest showed an increased percentage in the acquisition of the non-target words. After being exposed to incidental information that was embedded in the task direction, these students were able to expressively identify non-target information at a mean level of 53.8% and could receptively identify 70.8% of the same information. The authors considered this acquisition of non-target stimuli that was presented during direct instruction of the target stimuli as another measure of efficiency.

In the study by Griffen et al. (1998), incidental one-to-one arrangement learning by 5 students with moderate disabilities was assessed. Participants ranged in age from 6 to 11, with IQs from 45 to 53. This study used a simultaneous prompting procedure

to assess learning of target (occupation words) and non-target stimuli (pictures of occupation words). Forty-eight environmental words (e.g., ponderosa, Rupp arena, commonwealth) were selected based on their use in current and future community-based instructional activities. The words were selected because student responses were at 0s percent correct for both word identification and the non-targeted information (i.e., photograph identification, and information about the photographs).

Incidental learning was assessed during two sessions before instruction and during two sessions after criterion was reached on each of the four word sets. The non-targeted information was delivered after the correct response of the student to the target word. After delivering the feedback statement (verbal model), the teacher immediately presented a photograph of the community location of the word, identified the photograph (e.g., "This is commonwealth stadium"), and provided the additional information (e.g., commonwealth stadium is where U.K plays football").

The non-target stimuli included a verbal expressive information statement in response to the presentation of photographs and the teacher statement. The incidental learning appeared in two different schedules: continuous (every trial) and intermittent (every fourth trial). The two different schedules of the presentation of incidental information were effective. A minimal difference was found when comparing the two schedules in the acquisition of non-target words. There were no significant differences between the two schedules in regard to the number of sessions and percent of errors that occurred. The amount of instructional time required to implement sessions using a continuous presentation schedule was higher when compared to the intermittent schedule. The overall results of acquisition of incidental learning indicated that all

students completed the photograph identification task with a 100% accuracy, except one student who completed set 3 with 50% accuracy. Data on maintenance probe sessions that were conducted 7, 14, and 28 days after reaching criterion indicated that all students acquired the incidental information with 100% accuracy.

The third study used photograph identification and was conducted by Wolery et al. (1991). The authors discussed the effects of presenting incidental learning on future target stimuli. The focus of the study was to determine if presentation of words in the consequence events for photograph naming would result in more acquisition of both words and photographs than when the words were not presented as part of the consequence events for photograph naming. Eight students with moderate disabilities participated in two experiments to name photographs. In the first experiment, four students ranged in age from 6 to 13 years, with IQs ranging from 40 to 51. PTD was used to teach eight photographs depicting occupations found in the community. The photographs were divided into two sets of four stimuli each. Correct responses in the first set resulted in the presentation of praise with the printed word for the occupation depicted in the photograph (future condition). The correct response in the second set resulted in the presentation of the praise alone without the future condition.

The second experiment was a systematic replication of the first experiment. The authors used the same procedure but with four different students from a different school. Students ranged in age from 6 to 11, with no IQ test scores reported. However, results indicated that the presentation of the future stimuli (i.e., word) did not interfere with the efficiency of PTD procedure. Students learned both sets of photographs and were able to name the photographs and read the words in the future condition more

effectively than in the non-future condition. The authors recommended the use of incidental learning to reduce instructional time, number of trials, and the rate of errors to criterion for future learning conditions.

Two studies added additional non-targeted verbal information as a part of functional sight words/phrases instruction. Gast et al. (1991) and Schuster et al. (1996) inserted related information supplied by the teacher in the consequence events. For example, Gast et al. (1991) compared the effect of PTD procedure and Least to Most (LTM) procedure on the acquisition of reading recipe words. Participants were 4 students with severe disabilities who enrolled in a self-contained classroom in a rural, public high school. The four students ranged in ages from 15 to 19 years, with IQs ranging from 29 to 50. Incidental learning was assessed when additional non-targeted information was embedded in either the prompt hierarchy of LTM or in descriptive praise statement delivered during PTD instruction.

The authors conducted a pretest prior to the beginning of instruction and a posttest after participants reached criterion level responding to each pair of target words. Assessment of incidental learning included the student pointing to the correct recipe action/word, performing the correct action/gesture with an object represented by the functional sight words/phrases, and pointing to the correct action/picture. The non-targeted information was presented following verbal praise of the response of the word, in which the teacher showed the student a picture of the action represented by the word and labeled the action for the student (e.g., "This is stir"). The pretest and posttest data of incidental learning showed that embedding such information in either the prompt hierarchy or the descriptive praise statement increased the receptive identification of the

action/gesture and action/picture that represented the target word to percentage at or above 84% on the posttest.

The second study by Schuster et al. (1996) also assessed the effectiveness of the CTD procedure when peers delivered reinforcement to 3 students with moderate disabilities. In this investigation, each student was assigned a peer (within the group) to deliver positive reinforcement following each correct response. Two males and one female who attended a self-contained classroom for students with moderate disabilities participated in this study. The students' ranged in age from 10 years, 3 months to 11 years, 11 months; their IQ scores ranged from 40 to 58 (M=49). Thirty-six (36) grocery words were divided into 9 instructional sets with 4 words per set. Each student was presented with four target words, 4 times during a training session, with a total of 16 trials.

The teacher used a 0s delay interval during the initial training session for each instructional word set followed by a 5s delay interval throughout all subsequent training sessions. During the training session, the teacher delivered verbal praise to a student for a correct response, then immediately verbally prompted the assigned peer to deliver additional reinforcement (i.e., token). If the peer student who was assigned to deliver the reinforcement failed to do so, the teacher then presented the verbal prompt to the student. The non-targeted information was presented as feedback that consisted of a statement pertaining to either the function of the referent to the target grocery word or the function of the target grocery word when it appeared on an aisle sign.

The authors indicated that their students acquired between 83% and 100% of the non-target stimuli. Researchers indicated that several reasons might explain these

results. These included that students had exposed to the use of incidental learning before conducting the study and/or incidental learning (non-target word) was related to the target behavior. Additionally, the use of peer reinforcement and the mode of delivery of incidental learning (i.e., verbally stated rather than written on cards for students to read) might be responsible for the acquisition of a high level of non-target words.

To assess students' ability to acquire the non-targeted spelling information, Alig-Cyberiwsky et al. (1990) taught functional sight words/phrases reading to four students with developmental delay while simultaneously inserting information on how to spell these words. Participants were enrolled in a preschool/kindergarten classroom and ranged in age from 4 to 5 years. Twenty-four unknown words were assigned to the four students. Types of words were not specified. Each student was taught two of the six target words at a time with six trials per word during each session. The focus of the study was to compare the effects of a specific attentional response to general attentional response on the acquisition of the functional sight words/phrases. The specific attentional response required the student to repeat the letter names when shown a flash card with a target word. The general attentional response required the student to look at the card when instructed by the teacher.

The teacher started the session saying, ("Child's name), What word?" If there was no response within 3s, the teacher modeled the correct response and then waited 3s for a response. Descriptive praise and token reinforcement were provided following correct anticipation and correct waits. Following the nonwait anticipation, wait errors, and no response, the teacher indicated, "No, the word is___", and waited for a 3s

interval before moving on to the next trial. Asking the child to wait his/her turn to talk was used to control interfering behaviors. After a fourth interference, the child was removed from the group.

The non-targeted information was presented in the antecedent events, which occurred before the delivery of instruction. The preschoolers were required to spell each target word before responding to the target request to read each word. The use of this strategy was to be effective in increasing receptive spelling and word identification for all students. Receptive spelling improved from 8% to 70% for target functional sight words/phrases. The ability to receptively spell the words was more effective when using the specific attentional response. The mean word acquisition for receptive spelling with the specific attentional response was 91% as compared to 48% with the general attentional response.

In summary, a total of 10 studies used incidental learning technique when teaching functional sight words/phrases. The studies included a variety of students with disabilities and were conducted in preschool, elementary, and secondary schools. Non-target information was presented verbally (i.e., the teacher says it), visually (i.e., flash cards, photographs), and/or by a combination of the two modalities (i.e., teacher says it while presenting the flash cards and/or the photographs). Non-target information was presented in the antecedent events, which occurred immediately after the delivery of the instruction (Alig-Cybriwsky et al, 1995), and in consequence events that occurred after the correct response of the students on the target word (Griffen et al, 1998).

Results of these studies indicated that students acquired some, and in other cases most, of the non-target behaviors presented in the consequent events (Gast et al, 1991).

Students benefited from incidental learning when: 1) one additional piece of information was presented for each target behavior, and 2) when two pieces of extra information were presented for each target behavior taught simultaneously on each trial (Gast et al, 1991), or separately on alternating trials (Wolery et al, 1991). The use of incidental learning did not appear to interfere with the speed in which target behaviors were acquired and did not increase session length (Wolery et al, 1991).

There is, however, a need to extend the disabilities population studies when using the incidental learning technique. None of the studies included students with profound disabilities or severe visual impairments. All studies occurred in either a special education classroom or resource rooms. Research is needed to see if these procedures are effective in general education settings. Research on incidental learning technique could also focus on different schedules and methods of presentation. For example, researchers could examine the effect of delivering incidental learning techniques on every other trial as compared to every trial.

Chapter 3

Methods

Participants

This study involved six students attending self-contained classrooms for students with moderate and severe disabilities. All students were enrolled in one special education school located in Anne Arundel County. Three students who participated in this study where from the same classroom, whereas the other three students from separate classrooms. The students ranged in age from 5 to 8 years of age and all scored 55 or less on the Intelligence Quotients (IQs) Test. In addition to the IQ requirement, participants scored two standard deviation below the mean on a standardized norm referenced measure of adaptive behavior in at least two of the following areas: communication, self-care, home living, social skills, self-direction, functional academic skills, work, leisure, and health and safety. Assessment information for both IQ scores and adaptive behaviors for three students (Jeff, Linda, Nancy) was based on information from Bayley Scales of Infant Development II administrated in 1998 (three years earlier). Information for two students (Ann and Frank) was taken from Battelle Developmental Inventory (BDI) administrated in 2000 and 1998, respectively. For the remaining student, Mike, the IQ and Adaptive behaviors scores were taken from the CAT/ CLAMS administrated in 1999. Specific information on the gender, chronological age, diagnosis, IQ, and adaptive behavior scores are provided in Table 4. Also, provided in this Table are the diagnosis for each student.

In addition to the requirements outlined above, teachers were asked to select participants based on: (a) a diagnosis of moderate and severe disabilities as defined by

Table 4
Participants Demographic Characteristic

Participant	Age	Gender	Diagnosis	IQ	Adaptive Behavior	
Ann	7,1	F	Arnold-Chiari Mal-formation	45	Personal-social	39m
			Spina Bifida		Adaptive	23m
			Hydrocephalus		Gross motor	7m
			Progressive scoliosis		Fine motor	29m
					Receptive	23m
					Expressive	16m
Jeff	7, 9	M	Pervasive develop-mental disorder	30	Social interaction	23m
					Self help	26m
					Gross motor	78m
					Fine motor	46m
					Receptive	12m
					Expressive	12m
Frank	5, 5	M	Pervasive develop-mental disorder	52	Social skills	12m
			Recurrent otitis		Self help	15m
			Remote history of asthma		Gross motor	21m
					Fine motor	22m
					Receptivie	11m
					Expressive	10m
Mike	5,7	M	Autism	42	Gross motor	24m
					Fine motor	11m
					Self help	14m
					Receptive	6m
					Expressive	6m
Linda	5, 5	F	Moderate mental retardation	47	Social skills	12m
					Adaptive	12m
					Gross motor	16m
					Fine motor	12m
					Receptive	10m
					Expressive	5m
Nancy	5, 5	F	Moderate mental retardation	48	Social skills	12m
					Self help	12m
					Gross motor	19m
					Fine motor	12m
					Receptive	11m
					Expressive	6m

state guidelines, (b) the ability to respond to auditory and visual stimuli, (c) the ability to use visual identity matching skills, (d) the ability to verbally imitate target words and definitions, (e) the ability to sit or stand and visually attend for at least ten consecutive minutes, (f) the ability to wait 5s for a verbal prompt, (g) the ability to comply with verbal directions, (h) the ability to use appropriate eye contact with the teacher and stimulus materials, and (i) the ability to select a reinforcer from a provided array (see Appendix A).

Prior to the initiation of this study, the parents or legal guardians of selected students were asked to give permission for their child's participation in this study (see Appendix B). A parent permission letter was sent to each student's home, along with a self-addressed stamped envelope. The letter provided information on how to contact the researcher, so that parents could obtain additional information and ask questions about the study. It should be noted that information on prior reading instruction was not collected. Thus, it was not known what, if any, sight word instruction occurred previously for theses students. Based on the investigator’s observations, reports from the classroom teachers, and the review of students’ records, more specific information about students selected to participate in the study is presented bellow.

Ann. A seven-years and 1 month old. She has a complex medical history and has been receiving special education services through Anne Arundel County Public Schools since infancy. She has spina bifida with a number of associated complications. Her progress is a steady, but slower than the normal rate of development. She has unevenly developed skills, secondary to motor impairments. Ann shows tremendous strengths in her social skills and is described as highly

motivated to improve those areas that enhance her abilities to interact with others (e.g., functional motor/positioning skills and expressive language).

Ann is a very social little girl, who smiles readily when greeted by adults in the school, greets familiar adults spontaneously, and expresses affection and concern for others (e.g., if another child in the classroom is in distress). She is well integrated into the classroom, follows the class routines, participates in all classroom group activities, interacts with peers, and is able to take turns and play cooperatively. With high preference activities, Ann will initiate work tasks without adult prompting and can complete work tasks that are familiar. She needs more supervision to sustain her attention to tasks that are novel or that are not high preference for her.

Expressively, Ann uses single words and word approximations (up to 2-3 syllable words) to express her needs and wants. She uses words like "cheap talk" to ask for "more snack". Although it can be challenging for an unfamiliar listener to understand her, Ann is highly motivated to improve her communication skills. She is very diligent in her efforts to articulate better, such as adding appropriate ending sounds. Ann uses words to label what she sees or wants. She tends to say "mama" non-specifically for a response to anyone she greets. At school, Ann tries hard to be part of adult discussions or conversations.

Ann has made improvement in the time she needs to process information and respond. Currently, with routine requests or questions, no delay in response time is observed. She understands one-step directions and some two-step familiar directions. She understands some prepositional commands such as "in", "out", and "on", but not more advanced ones such as "behind", "in front of", etc. Ann is able to

answer simple "yes" and "no" questions from a story that is read to her. She can also point to named pictures in a book.

Jeff. Jeff exhibits delays in all areas of development as measured by the Scale of Independent Behavior. However, strength is indicated in gross motor skills and domestic skills. Fine motor skills are near a 4-year level of development. Significant delays are evident in the areas of self-care, expressive language, and social interaction skills. Performance in these areas is very low and average about a three and one-half year level of development.

Jeff exhibits difficulty with internalized behaviors, but has eliminated externalized, aggressive tendencies exhibited in the past. He frequently engages in head banging. The onset of this behavior is unpredictable, but Jeff usually appears in control of this behavior and uses it as a form of protest. Jeff's head banging behavior is not considered hurtful to others or property. Jeff is usually cooperative and not considered disruptive in class. Previous evaluations resulted in a diagnosis of Pervasive Developmental Disorder.

Academically, Jeff has difficulty matching/sorting more complex forms, such as coins and words beginning with the same letter. He also becomes confused with multi-pieced assembly tasks. He has difficulty attending to group instruction, especially if there are few visual/tactile components. He does not consistently recognize many words or associate letters with sounds. When asked to imitate a sequence of steps, Jeff will often imitate (or repeat) only the last thing the adult modeled for him. He has difficulty using attributes such as size and shape, except in the context in which they are learned and practiced.

Frank. Frank is five years and five months old. Major problems faced by Frank include recurrent otitis as well as a prior history of asthma and a febrile seizure in the past. Developmentally, Frank has demonstrated significant delays in his expressive language, and his receptive skills are inconsistent. He also exhibited some perseverative behaviors, and his social interactions were limited. Frank further stood out as a student with significant aggression and noncompliance behaviors, although he has made significant improvements in these areas during the last year. During his first year in his current class, Frank often screamed when asked to do things, and routinely fell to the floor and refused to comply. Adult physical assistance was often necessary to get Frank to stay in his chair and perform individual work activities.

In the past, Frank was often unable to focus on more than one activity or toy. For example, during small group work with the speech therapist, Frank would concentrate on just one toy that was brought as part of the group lesson, and scream and cry until he got the toy. Then he experienced difficulty giving it up. A great deal of the group time was consumed by Frank's behavior, and the speech therapist frequently had trouble introducing new toys or initiating other activities.

More recently, Frank’s behavior in the classroom and, as a result, his ability to benefit from instruction improved dramatically. He works much more independently, checks his schedule, and goes to the work area on his own. He now needs only occasional assistance with challenging tasks. He is able complete up to four work tasks in one individual work session, staying focused for 20 - 25 minutes. He still occasionally attempts to avoid work tasks, sometimes by pretending to be

sleeping or by verbally objecting to activities, but this happens less frequently and usually only occur when an activity is new to him or very challenging.

Frank is currently very social and greets familiar people and starts conversations. He initiates activities with classmates (one in particular) and also makes complementary comments to an adult or peer. Although he engages in play with peers whose abilities are close to his level, he avoids play with children whose ability are less well developed.

Despite these recent improvements, Frank still displays a number of behaviors that interfere with more optimal functioning in the classroom. He sometimes exhibits strong, emotional and negative responses at times to ordinary. Although these responses are inconsistent for the most part, certain activities consistently elicit a strong negative reaction. He further has difficulty with changes in routines. He checks his schedule every day when he arrives at school, and may object to changes that occur during the course of the day.

Mike. Mike is five years and seven months old. He has a Pervasive Developmental Disorder. Behavioral concerns noted during his initial evaluation included limited eye contact and idiosyncratic babbling. Mike displayed delayed, but also atypical, language skills as well as atypical social interaction and repetitive patterns of play. There was no concern regarding Mike motor milestones. He crawled at eight months of age and was walking independently by eleven months. Currently he can run, climb, and walk up and down stairs without difficulty.

Mike is a visual learner who can select hand-hidden toys, knows all the names of his classmates, and can spell their names. He imitates some actions during small

group activities, and join in some nursery rhymes and songs. Mike can use a picture exchange system to indicate recognition of pictures for familiar objects. He does not, however, point to big, little, or empty objects, and has difficulty recalling familiar objects or identifying familiar objects by their functions.

Although he is not very social, Mike initiates contact with familiar and unfamiliar adults. He does not ask for help when needed, however. Mike does not interact with peers on a regular basis or participate in group play when paired with more typically developing peers. Mike communicates through gesture, some verbalizations, and a picture communication system. He can name all the letters of the alphabet, state numbers 1-10, and verbalize familiar words and names. He can ask for snack foods and drinks, and imitate words into a microphone. He cannot follow two-step commands that are paired with pictures, or use three or more phrases consistently without the use of pictures.

Linda. Linda is five years and five months old. Her problems initially included extreme tactile defensiveness, limited eye contact or social responsiveness, and severe gross motor delays. At the age of 21 months, Linda was not sitting, standing, or crawling. She resisted any type of handling for general care such as bathing, diapering, or dressing, and screamed often as a general way of communicating distress. However, a remarkable qualitative change in Linda's motor skills has been reported. Responsiveness to the environment, ability to play and explore, social receptiveness and interaction, and overall sense of security and attachment have developed considerably.

Linda's parents reported that she has shown dramatic changes since coming to live with them at 21 months of age. She has become more independent and uses bilateral hand skills in play. Although she continues to be cautious and tentative in her exploration and still has difficulty with transitioning to a new place, she is more tolerant of sensory input. Furthermore, she has become interested in socially interactive games, and has bonded with both parents. Finally, once she is comfortable in a new situation, Linda freely explores and plays independently.

Academically, Linda is showing interest in books. She holds books right side up and turns the page, listens to stories, and points to pictures in books. She is able to identify large and small objects, and able to points to and place objects on top or bottom. She can select objects that are alike, sort objects by color, and sort form by shape.

Nancy. Nancy is five years and five months old. She was born prematurely and experienced significant early deprivations during the first 20 months of life. This time was spent in an institutional setting, where her life was characterized by general environmental deprivation and lack of sensory experience. She exhibited significant oral defensiveness, as well as other sensory/social sensitivity, such as not allowing others to touch her, especially her hands.

She has received early intervention service since 22 months of age, and subsequently made a great deal of qualitative changes in her tolerance to sensory input, social interaction, and transition from one activity to the next. Gross motor abilities have shown the greatest quantitative changes. Current developmental levels are consistent with expectation for person with mental retardation.

Academically, Nancy links schemes in simple combinations. (puts person in car and pushes car). She matches objects by color, size, and shape. She can also identify a circle, triangle, rectangle and square. Nancy recognizes colors, can say the numbers one through ten consistently and name the letters of the alphabet. Nancy can count to twenty and on occasion up to 31. She can group sets of objects up to five. Furthermore, she has mastered the concepts of big and small.

Setting

Most of the instruction was conducted in a resource room located in the participating school. This school was a school for students with special needs. There were some days when the resource room was occupied and the instruction was delivered in an empty classroom. Sessions were conducted each school day either during the morning or the afternoon. The investigator picked up and dropped students off at their respective classroom before and after instruction. Three of the students (Mike, Linda, and Nancy) were in one class, whereas the other three (Ann, Jeff, and Frank) were in another. Each instructional session involve the instructor and one student. During instruction, the student was seated at a table, with the instructor seated in front of him or her.

Survey of back-up reinforcement.

To increase the students' participation in the study, teachers were asked to fill out a reinforcement survey to indicate what items they thought would motivate their students to perform better in the study. From a list of possible reinforcers, teachers were asked to remove any items that were not suitable and add items that were. The investigator and the classroom teacher were in contact with parents through the use of a

home-school notebook to help specify appropriate reinforcement. This was to help ensure that the student was not given anything that was contrary to the parents' wishes. With every unprompted response during instruction, the student earned pennies that were counted at the end of the week. These pennies were redeemed for a more desired reward. The investigator provided a basket that contained both edible and inedible items (e.g., candies, chips, crackers, stickers) for the students to select. Items in the basket were assigned different values, meaning that a student who earned 3 pennies during the week might select from certain items, whereas the student who earned 5 pennies might select from another group of items deemed more valuable (see Appendix C). The rationale for using pennies was that their use helped to establish counting skills and the value of money.

Pre-assessment of Functional sight words/phrases

A pool of 60 potential words to be taught were selected by the investigator from Reading Problems: Assessment and Teaching Strategies by Richek et al. (1996). The teachers were given the list of 60 words to evaluate. For each participating student, his/her teacher was asked to assess each functional sight words/phrases on two dimensions: (a) appropriateness to the child's IEP goals, (b) and appropriateness to the child's current level of ability. Each word selected was assessed as being appropriate or not appropriate on both dimensions (see Appendix D).

Once a pool of potential words was selected based on teacher input, participating students were then tested individually two times on their recognition of all words (over two consecutive days). During this assessment, each word was presented to the student with the cue, "Look at the word. Read the word", and students were given

5s before the investigator marked the student's response as correct, incorrect, or no response. Words that were recognized by students during the tested sessions are presented in Table 5. In addition, the definition of each word was tested during this assessment. Each student was asked to define the selected words. The investigator asked the student, "What does______ mean?" and student was given 5s before the investigator recorded the response as correct, incorrect, or no response. Responses were scored as correct if the student gave a synonym for the word and/or gave a commonly accepted definition. Students were not required to state the exact definition supplied by the investigator during training.

Functional sight words/phrases to be included in the study were those that students did not read and define correctly during both of the assessment sessions. These words were considered "Unknown" and formed a pool of unknown words. Words to be taught to students during the study are presented in Table 6.

After the pool of "unknown" words was identified, teachers were asked to indicate which of these words they would like students to learn. Of the words that were selected by the teacher for each student, 12 were randomly selected for inclusion in this study. These words were then assigned to 3 sets of 4 words each. These sets of words were constructed so that they contained words of equal length and so that topographically similar words (e.g., "Push" and "Pull") were not placed in the same set. Each word was printed with black ink on 4x6 inch index cards. The definition of the word was printed on the opposite side of the card to remind the investigator to provide this incidental information during instruction.

Table 5
Students' performance on a list of 39 words tested over two consecutive days

Student	Total Words	Words Read Correctly	Percent of Words Read Correctly
Ann	78	3	3
Jeff	78	0	0
Frank	78	0	0
Mike	78	0	0
Linda	78	8	10
Nancy	78	5	6

Table 6
Specific Functional sight words/phrases Assigned to Each Student

Student	Set 1	Set 2	Set 3
Ann	Apple	Teacher	Snow
	Shoes	School	Exit
	Baby	Stop	Table
	Push	Closed	Hot
Jeff	Fence	Apple	Exit
	Out	Open	Baby
	School	Table	Telephone
	Teacher	Walk	Push
Frank	Teacher	Table	Open
	Snow	Exit	Bus Stop
	Bed	Tree	Hot
	Chair	Baby	Telephone
Mike	Table	Teacher	Open
	Exit	Snow	Bus stop
	Tree	Bed	Hot
	Baby	Chair	Telephone
Linda	School	Do not walk	Do not enter
	Teacher	Snow	Danger
	Keep out	Children	Push
	Open	Rain	Closed
Nancy	Telephone	Hand	Danger
	Table	Spoon	Ear
	Rain	Fork	Closed
	Walk	Children	Hot

Social Validity of Definitions

Social validation is a concept that addresses the quality, value, and acceptability of the educational program (Snell & Brown, 2000). It focuses on the acceptability of the program goals, instructional procedures, and the importance and social appropriateness of the behavior change. To determine the validity of the procedures or strategies, the researcher must ask the opinions of significant people who are experts or quite familiar with students' environment. Snell and Brown (2000) reported that the subjective and honest opinions about the behavior to be changed could be sought from people who have a vested interest in the student (e.g., parents, friends, teachers, professors).

In this study, social validity of the definitions of functional sight words/phrases was assessed. To determine whether definitions were functional and meaningful for students, the investigator consulted teachers of the students and other professionals to help develop significant definitions that were perceived to be appropriate. One professor at the University of Maryland at College Park and three special education teachers at the students' school were contacted to determine the social validity of definitions generated by the investigator. Professors and teachers were asked to review definitions and ascertain whether the existing definitions of the functional sight words/phrases reflected their true meanings. They were also asked to make any further changes that they deemed necessary. After this review process, the final list of definitions was compiled (see Appendix E).

Design

A multiple probe design (Tawney & Gast, 1984) across word sets and replicated across subjects was used to determine the effectiveness of the CTD procedure in teaching functional sight words/phrases recognition in a one-to-one arrangement. Unlike other designs, baseline data are *not* collected on a continuous basis on behaviors that have not yet been introduced to the intervention. Instead, probe trials (trials that are operationally identical to pre-intervention baseline trials) are conducted intermittently on behaviors that are "to be taught".

Horner and Baer (1978) recommended that the multiple probe design begin with an initial probe for every baseline, followed by an additional probe of each baseline after the desired criterion levels have been reached, or stabilization of behavior change has occurred for any baseline that has been exposed to the intervention. They recommended a follow-up procedure of a series of consecutive probes for any given baseline immediately prior to its exposure to the intervention procedure. This series of consecutive probes before the intervention is increased by one while the procedure is conducted on each additional baseline. For instance, for the first baseline exposed to the intervention there will be a minimum of three probes, four probes for the second baseline, and five probes for the third baseline, and so forth. Finally, after reaching the desired criterion level for each behavior or set, intermittent probes will be taken to ensure that the targeted behavior has been maintained.

Experimental control will be demonstrated when probe performance on untrained words remains stable during baseline (before introduction of the CTD procedure) and increases to criterion level after implementation of the CTD

intervention. Tawney and Gast (1984) indicated that if the response of each individual subject stays at or near baseline level across intermittently conducted probe trials and a targeted behavior improves after the implementation of the instruction (intervention), a functional relationship between the introduction of the instruction and a change in the behavior has been demonstrated.

The multiple probe design provides intermittent probes that are an alternative to continuous baseline measures. This is an advantage over the more time-consuming continuous data collection, and easier, particularly, for researchers who employ a databased classroom instructional model in an attempt to collect data on most students and instructional programs. The amount of time a teacher devotes to instruction is increased, based on the time saved by using intermittent probes over the continuous baseline procedure.

Despite the advantages of the multiple probe design, there are also some potential disadvantages that must be taken into consideration. First, if the researcher does not extend the baseline measurement procedure until a stable level of responding is established, results may not be interpretable because of potential complications due to uncontrolled history, maturation, or testing effects. Second, any conclusion about the functional relationship between a behavior and the treatment are undermined if baseline performance on untaught behavior improved at the same time as the instructed behavior improved. Thus, researchers should be sure, before presenting the instruction, that all targeted behaviors are functionally independent (Tawney & Gast, 1984).

General Procedure

This study included two types of experimental conditions, the probe condition and the constant time delay procedure (CTD). Probe sessions assessed the learning of target and non- target stimuli; namely, functional sight words/phrases definitions presented during CTD instructional sessions. Criterion for mastery of functional sight words/phrases was set at 100% of unprompted correct responses over two consecutive sessions when reinforced on a continuous reinforcement schedule (CRF) followed by one session when reinforcement is delivered on an average of every third correct response (VR3). A one-to-one instructional session was held each school day. Each student received twelve target words, four of which were assigned to each of three sets. Every student received twelve trials in each session (4 words x 3 trials). Students were exposed to CTD procedure for the first time. Based on the teachers feedback and students' records there was no indication that any of these students had prior experience with CTD procedure.

Probe procedures for baseline, during-instruction, and maintenance. Probe sessions were conducted for each student (a) immediately prior the presentation of instruction (baseline), (b) just before each instructional session, and (c) after criterion level was met on each word set (maintenance). Probe conditions occurred in a one-to-one format and assessed each student ability to identify targeted functional sight words/phrases (n = 12). Each word was presented three times in random order. Instruction was introduced with each set when data were stable (variation is less than 10%).

An initial probe tested all 12 words that were taught to each student. After the implementation of the initial probe, the investigator established baseline for the first set of words to be taught to the student. During instruction, the first set of words was tested prior to each instructional session. Another probe was obtained on all 12 words when the student reached the criterion level for set 1 (unprompted 100% correct response for two consecutive days followed by one session when reinforcement was delivered on an average of every third correct response). Probe sessions continued for sets 2 and 3, taking into account that the number of probes increased by at least one datum point per set word.

Probe sessions began with the investigator holding up the word card, pointing to the targeted word, and stating the attentional cue, "(Student name), Look at me", the investigator delivered the task direction "Read the word" and waited 5 seconds for a response. Feedback was not provided for either correct, incorrect, or no responses for the baseline probe. Following the word probe, the investigator asked the student to define the word, "(Student name), What does_____ mean?" The student was given 5s to state the definition of the word following the question. For correct, incorrect, and no responses, the investigator recorded the response and then moves to the next word. All target words received three trials each in a random order. Verbal praises were delivered on a VR3 schedule for appropriate attending behaviors, such as looking at the card or sitting appropriately in the chair. At the end of the session, the student was praised for doing good work and allowed to choose a backup reinforcer (see Appendix F).

Instructional Procedures of Constant Time Delay.

The investigator conducted instruction with the six students using a constant

time delay (CTD) procedure, for a total of five sessions a week. During each session, each student received three trials on each word for the four assigned words (3 x 4), for a total of 12 trials per session.

The 0s delay was used until the student responded with 100% accuracy on correct response for 3 consecutive sessions. During all subsequent sessions, a 5s delay was used until the student reached the 100% criterion level for unprompted correct responses for two sessions on a CRF reinforcement schedule. The positive reinforcement schedule was systematically thinned by setting the student performance criterion at 100% correct response on a VR3 schedule (reinforcing on the average of every third correct response) for one session.

During the first instructional session, the investigator used a 0s delay interval. The teaching of each word in a set occurred as follow. First, the investigator pointed to the word and said, (Student's name) "Look at me" to ensure that the target student was looking at the card. The investigator then delivered the task direction, "Read the word" and immediately provided the controlling prompt, "This word is closed, say closed". If the student responded correctly within 3s, the investigator provided descriptive verbal praise, which included saying, "Good," repeating the word name, and providing the definition of the word (e.g., " Closed means we can't go in"). The student then received a penny before moving to the next word.

If the student said a word other than the correct word or did not respond within a 3s latency, the investigator said, "No, This word is closed, say closed" and wait for 3s. If the student said the word correctly, the investigator then repeated the word followed by the definition (e.g., "That's right, the word is closed and means that we can't go in"),

and moved to the next word. If the student said another word, the investigator repeated the word with the definition and moved to the next word. If the student did not respond within 3 seconds, the investigator repeated the word followed by the definition of the word (see Appendix G).

After the student responded with 100% accuracy for prompted correct response using the 0s delay procedure, the investigator introduced a 5s delay, which was maintained for the remainder of the study. The 5s delay interval was inserted between the presentation of the task direction and the investigator's delivery of the controlling prompt. First, the investigator obtained an attentional response from each student by presenting a specific attentional cue similar to that given during the 0s delay instructional procedure. For instance, the investigator said, (Student name) "Look at me" to ensure that the target student was looking at the card. The investigator then held up the card, pointed to the word, and delivered the task direction, "Read the word" When using the 5s delay interval, the investigator followed the same procedures as for the 0s delay but waited 5s after the presentation of the word before delivering the controlling prompt.

During the 5s procedure, one of five possible responses occur: (a) unprompted correct responses (correct anticipation); the student states the target word within the CTD interval (5s) after the presentation of the task direction, but before the delivery of the controlling prompt; (b) the prompted correct response (correct wait); the student states the word correctly within the 3s latency after the delivery of the controlling prompt; (c) an unprompted incorrect response (incorrect anticipation); the student states an incorrect word before the delivery of controlling prompt; (d) prompted incorrect

response (incorrect wait); the student states an incorrect word within the 3s latency after the delivery of a controlling prompt; and (e) no response; the student fails to make a response within 3s after the controlling prompt.

With unprompted and prompted correct responses, the investigator said, “Good,” repeated the word, and then delivered the definition of the word. For example, during the unprompted correct response, the investigator stated the attentional cue, S” look at me,” pointed to the word, delivered the task direction, “Read the word,” and then silently counted to himself: 1001, 1002, 1003, 1004, 1005. If the student stated the word within the 5s delay (anticipated correct), the investigator said, “Good job, S.” then repeated the word and provided the definition (e.g., “This word is Exit and means the way you go out). The investigator then gave the student one penny and moved to the next word. If the student stated the word correctly after the 5s period (prompted correct), the investigator praised the student saying, “Good job, S.” then repeated the word and provided the definition (e.g., “This word is Exit and means the way you go out.”). The student received one penny before moving to the next word. Only the unprompted correct response was counted toward criterion performance.

Unprompted and prompted errors resulted in the investigator asking the student to say the word before delivering the controlling prompt with the definition. For example, during the unprompted error, the investigator provided the attentional cue “S, look at me” to ensure that the student was looking at the investigator. The investigator then held up the word card, pointed to the card, and delivered the task direction, “ Read the word” and wait 5s. If the student anticipated an answer and stated the word incorrectly (incorrect anticipation), the investigator said, “No. The word is Exit, say

Exit" then waited for 3s. If the student stated the word correctly, the investigator repeated the word and the definition (e.g., That's right, the word is Exit and means the way you go out), and moved to the next word. If the student stated another word, the investigator repeated the word with the definition before moving to the next word. If the student stated the word incorrectly after the 5s delay (prompted error), the investigator said, "No. The word is Exit, say Exit" then waited for 3s. If the student stated the word correctly, the investigator repeated the word and the definition (e.g., That's right, the word is Exit and means ...."), and moved to the next word. If the student stated another word, the investigator repeated the word with the definition before moving to the next word. No pennies were provided as reinforcement for correct answers during the unprompted or prompted error. If the student responded incorrectly for three consecutive trials, the investigator was allowed to change the controlling prompt to enhance the correct response. No response resulted in the investigator delivering the controlling prompt with the definition before moving to the next word (see Appendix H).

In order to complete instruction on a word set 1, the student had to meet the criterion level. That is, the student had to perform at 100% unprompted correct responses on all target words when reinforced on a CRF schedule for two consecutive sessions, followed by one session at 100% unprompted correct response when reinforced on a VR3 schedule.

Maintenance

Maintenance probe sessions for the functional sight words/phrases and their definitions directly taught to the student were conducted for students 1 through 6

approximately every four sessions after the student reached criterion. Another maintenance probe was administered one week after the final probe. Maintenance procedures were the same as those used during the probe session condition except that reinforcement was given on an average for every third correct response. Student's failure to maintain a correct response resulted in the retraining of the target word(s) to criterion level.

Generalization

Students were assessed on their abilities to recognize target words as well as definitions embedded in their target words when presented by a person not associated with the study. Generalization was measured by means of the investigator creating a list of sentences for each student that contained all of his/her targeted words (see Appendix I). The students were asked by a preschool teacher to identify the functional sight words/phrases and their definitions in the sentences that they read. This session was conducted in a resource room and was exactly like the probe sessions described earlier. Verbal praises were delivered on a VR3 schedule for appropriate attending behaviors, such as looking at the card or sitting appropriately in the chair.

Reliability

Reliability data on words read correctly were collected by an independent observer. Interobserver agreement was calculated between the investigator and an independent observer (a preschool teacher). Both investigator and the independent observer recorded the correct naming of functional sight words/phrases separately. Agreement was calculated by dividing the smaller number by the large number and multiplying by 100%. Reliability data were collected during 33% of all instructional

sessions. The reliability observer was taught how to use all scoring procedures by the investigator until she applied them with 100% accuracy.

Procedural Reliability

To ensure the integrity of the independent variable, the investigator's implementation of the procedure was assessed. The behaviors that were independently assessed included: the presentation of correct words in each trial, the request for student's to read the word, the presentation of task direction, waiting for appropriate prompt delay intervals, providing consequences for students' trials, and waiting for the latency period. This information was recorded on a procedural reliability data form (see Appendix J). The investigator's implementation of the established procedure was compared to the independent observer's observations. Reliability estimates for implementing the individual variables was calculated by dividing the number of actual investigator behaviors observed by the number of planned behaviors, and multiplying by 100%. Thirty three percent of instructional sessions were be observed by the independent observer.

Chapter 4

Results

Results from the current study are presented in this section. First, data on procedural reliability for the independent variable and reliability of the dependent measures are presented. Next, data relevant to each research question is analyzed.

Procedural Reliability.

Data on procedure reliability (i.e., the degree to which the investigator implemented the instructional procedure as intended) was collected by having an independent observer (a preschool teacher) record the instructional procedures implemented by the investigator during 33% of all instructional sessions. The procedural reliability score was obtained by dividing the total number of implemented steps in each observed session by the total number of planned steps and multiplying by 100%. The mean total of all steps correctly implemented for all instructional sessions observed was 95% (range from 77% to 100%). Thus, the investigator implemented the instructional procedures as intended.

Interobserver Reliability for dependent measures.

Data on the reliability of correctly scoring students' responses when they were asked to read words was collected during 33% of all instructional sessions. Interobserver agreement was obtained between the investigator and an independent observer (a preschool teacher). Both the investigator and the independent observer recorded the number of words read correctly. The agreement was calculated by dividing the smaller number by the larger number and then multiplying by 100%. The

mean observer agreement on students' performance was 97% (range from 83% to 100%). Thus, the investigator reliably scored this variable.

<u>Research Question 1:</u> Will the Constant Time Delay (CTD) procedure promote the acquisition of functional sight words/phrases?

Although the results of the implementation of CTD procedure varied from one student to the next, the CTD procedure was effective in teaching functional sight words/phrases recognition to the participating students with moderate and severe disabilities. Visual inspection of the data for each student (see Figures 1 through 6) showed that students' initial low level of performance on baseline probe (0% to 8% of words correct) improved substantially following the introduction of the 5s delay procedure for each set of words. Thus, sequential application of the CTD procedure resulted in substantial increases in the percent of words read correctly for each set of words for each student, reaching the criterion of 100% unprompted correct responding in a one to three week period.

Furthermore, as students' performance improved on one set of words, there was not a corresponding improvement in the baseline performance on the other sets of words. Finally there was no overlap between baseline scores and students' scores once the 5s delay procedure had been implemented. These results provide convincing evidence that the CTD procedure was an effective method for teaching functional sight words/phrases to the participating students with moderate and severe disabilities. Because there was some variability in the pace of learning, the progress of each student is discussed separately.

Ann. During the baseline for the first set of words that were taught (sessions 1 through 4), Ann did not read any words correctly during any session (see Figure 1). When presenting 0s delay in sessions 5 through 7, Ann continued to respond with 0 percent accuracy. With the introduction of the 5s delay procedure in sessions 8 through 11, Ann's performance steadily improved until session 12, when there was a slight decrease in her performance. This decrease was likely due to Ann being sick. By session 14, Ann was reading all words correctly, reading criterion two sessions later.

Visual inspection of the second set of the four assigned words revealed a 0 percent accuracy during the baseline (sessions 15 through 18) and during the presentation of the 0s delay procedure (sessions 19 through 21). With the introduction of 5s delay, Ann's performance improved steadily until session 26, at which point her performance because increasingly variable, until session 31 when Ann reached 100% correct responding (reaching criterion two sessions later). This variability appeared to be due to confusion with words in set 1, which were previously taught, and those in set 2, which were being learned at that time.

On the baseline probes administered for the third set of words (sessions 32-36), Ann did not read any words correctly. Similarly, during sessions 37 through 39, when the 0s delay procedure was in effect, Ann continued to respond with 0 percent accuracy. Once the 5s delay procedure was implemented, however, it took only three sessions before Ann was able to read all words correctly. By sessions 42 through 44 showed that Ann reached the criterion level for mastery of functional sight words/phrases.

Jeff. For words in set 1, Jeff scored 0% on all baseline probes and all probes administered during the introduction of the 0 delay CTD procedure (see Figure 2).

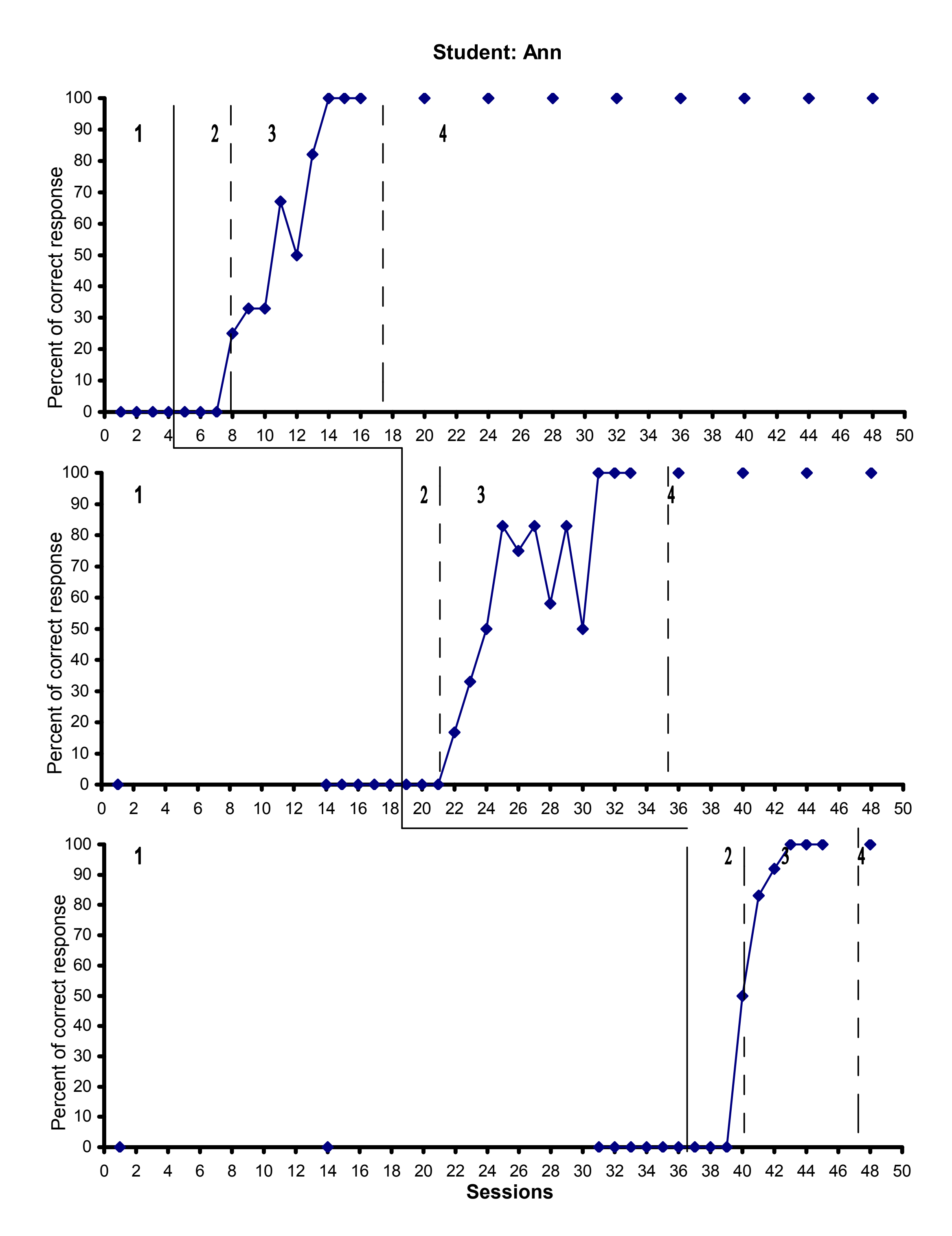


Figure 1. Percent of unprompted correct response by Ann during the Constant Time Delay across the three sets of words at baseline (1), 0s delay (2) instruction (3), and maintenance (4)

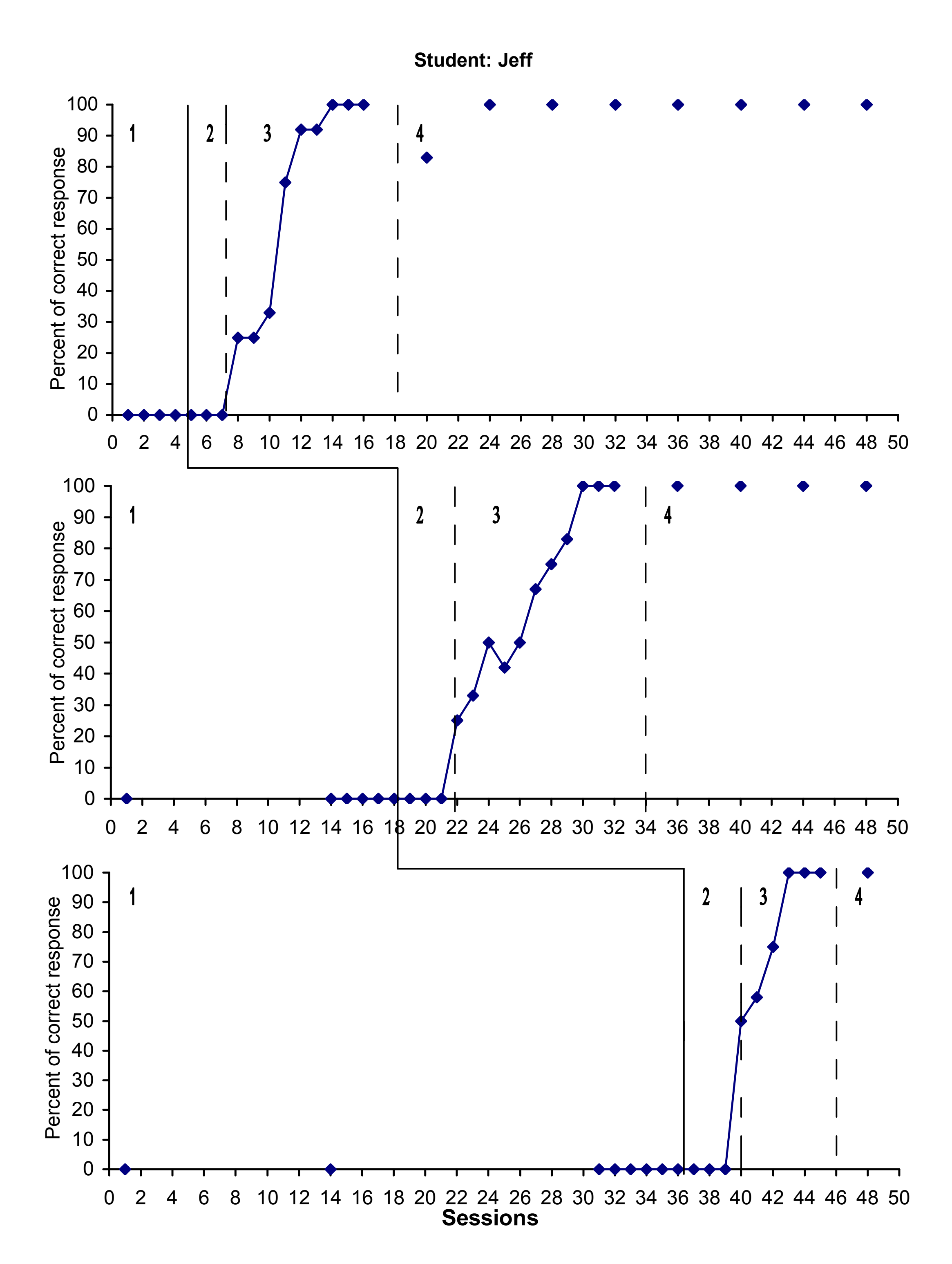


Figure 2. Percent of unprompted correct response by Jeff during the Constant Time Delay across the three sets of words at baseline (1), 0s delay (2), instruction (3), and maintenance (4)

During the presentation of the 5s delay procedure (starting in session 8) Jeff evidenced a steady improvement in reading words correctly, reaching 100% in session 14, and criterion two sessions later. On the words in set 2, Jeff scored 0% on all baseline probes and all probes administered during the 0s delay procedure. With the introduction of the 5s second delay procedure, his performance increased to 50% correct after three sessions, but he made a slight decline to 42% in session 26. The reason for this slight decline is unknown, but it did occur on a Monday. Thus, some forgetting may have occurred over the weekend. From this point on, Jeff performance steadily improved, reaching 100% correct at session 31 and criterion two sessions later.

With the words in set 3, Jeff reached criterion gradually. Following 0% correct responding during baseline and the 0s procedure, Jeff's performance improved to 50% (session 37) once the 5s delay procedure was in effect. He needed three more sessions to reach 100% correct responding; criterion was attained two sessions later.

Frank. In comparison to Ann and Jeff, Frank reached criterion very quickly (see Figure 3). Frank did not read a single word correctly across baselines for each set of words, nor did he read any word correctly during the use of 0s delay procedure for any word set. When the 5s delay procedure was introduced in session 8 for word set 1, he made rapid improvement reaching 100% correct responding three sessions later (in session 11), and criterion by session 13.

With set 2 words, Frank's performance improved rapidly following the introduction of the 5s delay procedure, increasing to 83% in three sessions. Over the next four sessions, however, he evidenced a set back; dropping to 75% words correct (sessions

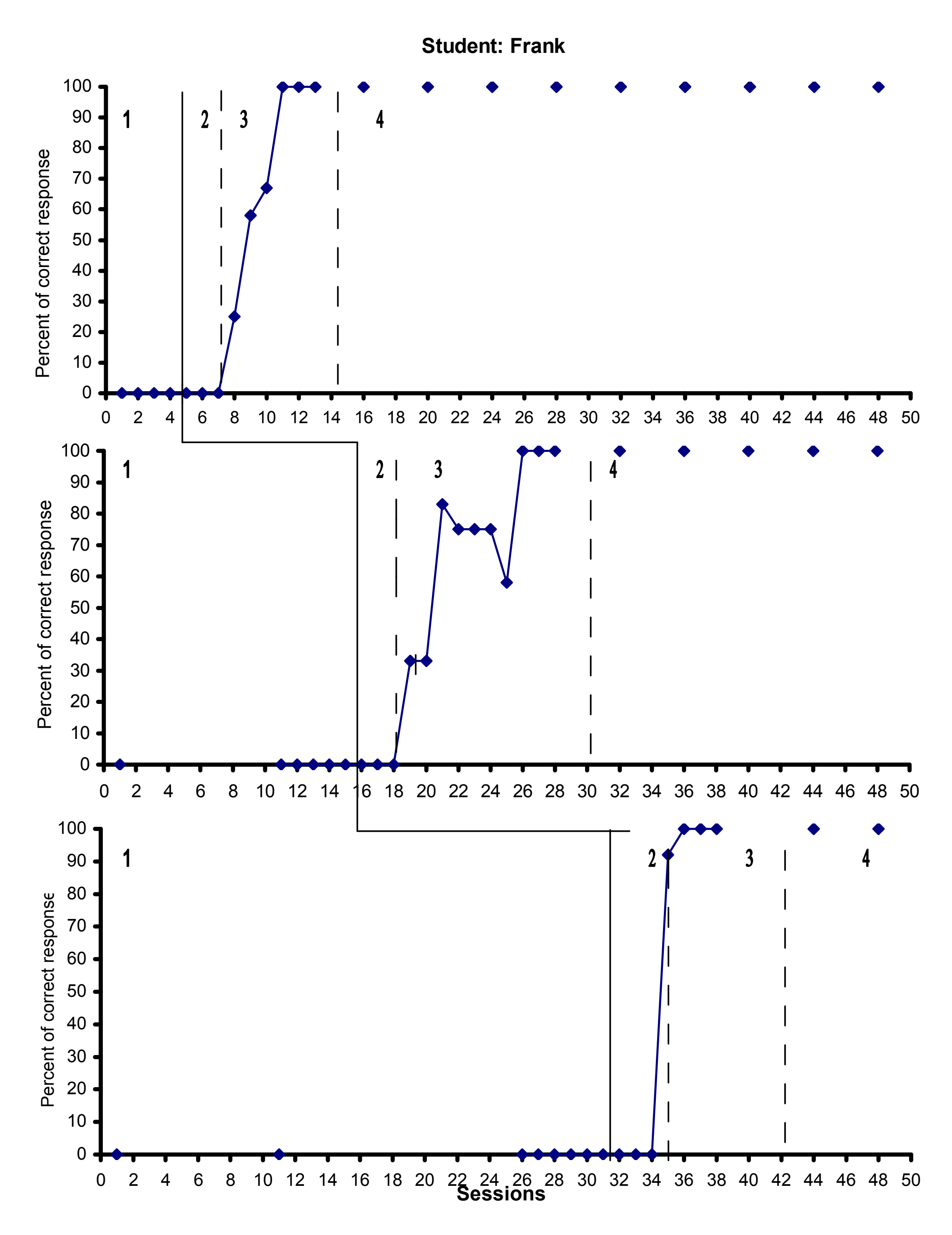


Figure3. Percent of unprompted correct response by Frank during the Constant Time Delay across the three sets of words at baseline (1), 0s delay (2), instruction (3), and maintenance (4)

22-24), and then to 58% in session 26. In the next session, however, Frank reached 100% correct responding and attained criterion by session 29. The decline in Frank's performance was likely due to the fact that he did not value the reinforcer that was used (i.e., money). Consequently, Frank was told in session 25 that he would receive a cookie for every four correct responses. Changing the reinforcer appeared to help improve Frank's performance. For the words in set 3, Frank reached criterion quickly once the 5s delay procedure was introduced. Following the first session (session 35), Frank's percent of correct responses jumped from 0% to 83%. Following the next session, Frank reached 100% correct responding. Frank needed only two sessions before he recognized all assigned words in set 3, reading criterion two sessions later.

Mike. Like the previous three students (Ann, Jeff, and Frank), Mike read none of the words correctly for any of the three sets on probes administered during the baseline or during the implementation of the 0s CTD delay procedure (see Figure 4). When the 5s delay procedure was introduced in session 8 for word set 1, there was steady improvement. Mike correctly identified all words correctly by session 12 and reached criterion two sessions later.

As with the other three students (Ann, Jeff, and Frank), the words in set 2 proved to be the most difficult for Mike to master. When the 5s delay procedure was introduced in session 19, Mike's acquisition of functional sight words/phrases increased to 16% in session 20, 58% in session 21, and 92% in session 22. Mike then made a slight regression to 83% correct in session 23, rebounding in the next four sessions to correctly identify 92% of the words correctly. In session 28, he read all words correctly and reached criterion two sessions later.

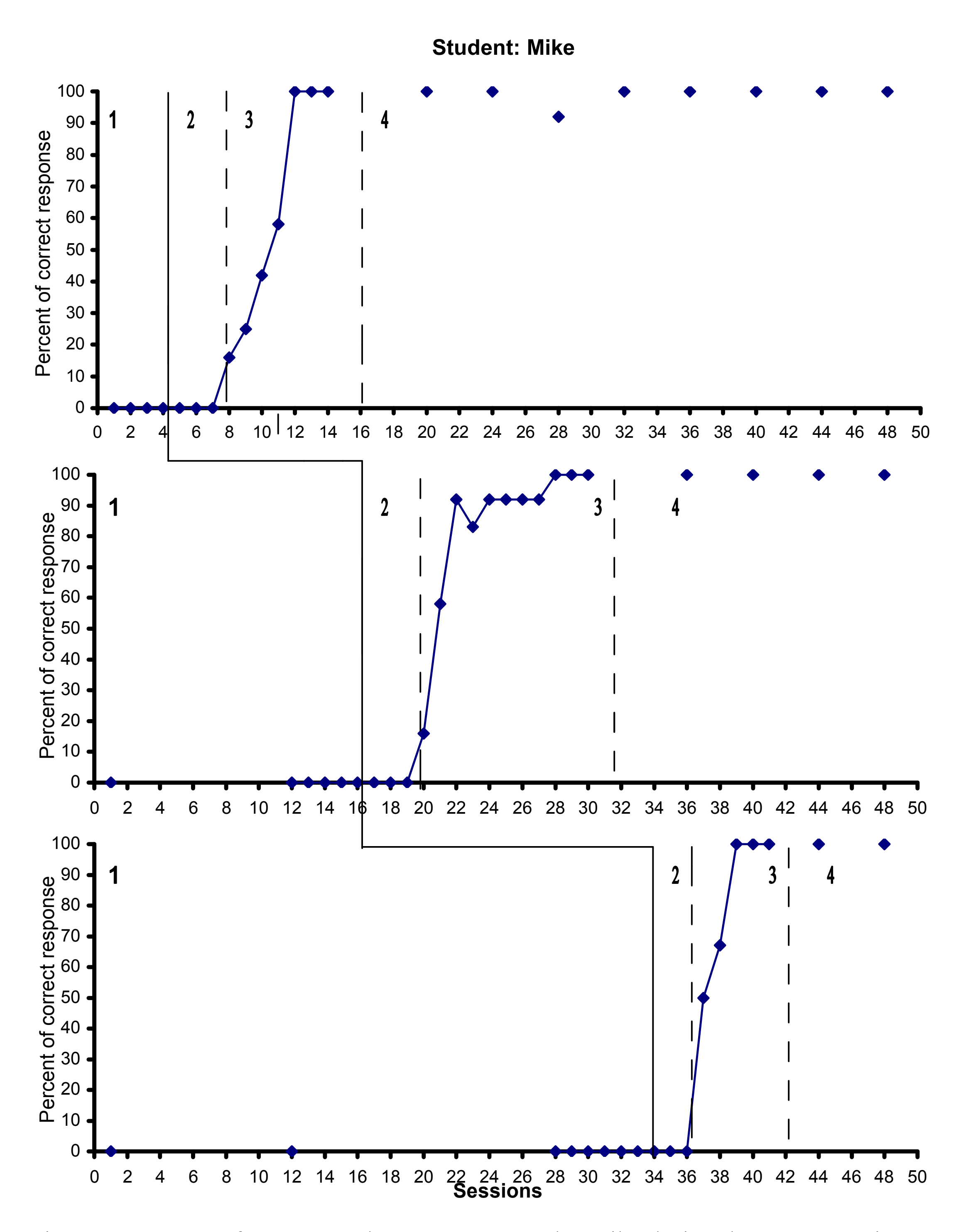


Figure 4. Percent of unprompted correct response by Mike during the Constant Time Delay across the three sets of words at baseline (1), 0s delay (2), instruction (3), and maintenance (4)

With word set 3, Mike's performance quickly improved to reach 100% correct responding in three sessions (37 through 39). In the first session following the introduction of the 5s delay procedure, percent of words read correct jumped from 0% to 58% (session 38). Two sessions later (sessions 39 and 40), he read 100% of the words correctly. By session 42, Mike had reached criterion for set 3 words.

Linda. In contrast to the previous four students (Ann, Jeff, Frank, and Mike), Linda had one session during baseline where her performance was not 0% correct (see Figure 5). This occurred in session 3, where she correctly identified one of the words in set 1. In all other baseline sessions, however, she did not correctly recognize any words. Likewise, she did not correctly recognize any words for any word sets when the 0s delay procedure was in effect. Once the 5s delay procedure was introduced for set 1 words, she met criterion quickly, improving to 67% correct in session 8, 83% in sessions 9 and 10, 100% accuracy in session 11. She attained criterion in session 13.

Unlike previous students, Linda quickly mastered the words in set 2. With the introduction of the 5s delay, Linda reached the desired criterion level within five sessions. After one session (session 19), the percentage correct rose to 58%; in the next session it improved to 75%; in the third session it attained 100% correct. Criterion was met at the end of the next two sessions. Just as with the other two sets of words, Linda mastered set 3 quickly. Once the 5s delay procedure was introduced, Linda's performance improved to 92% in the first session (30). In the next session, Linda reached 100% correct and met criterion two sessions later.

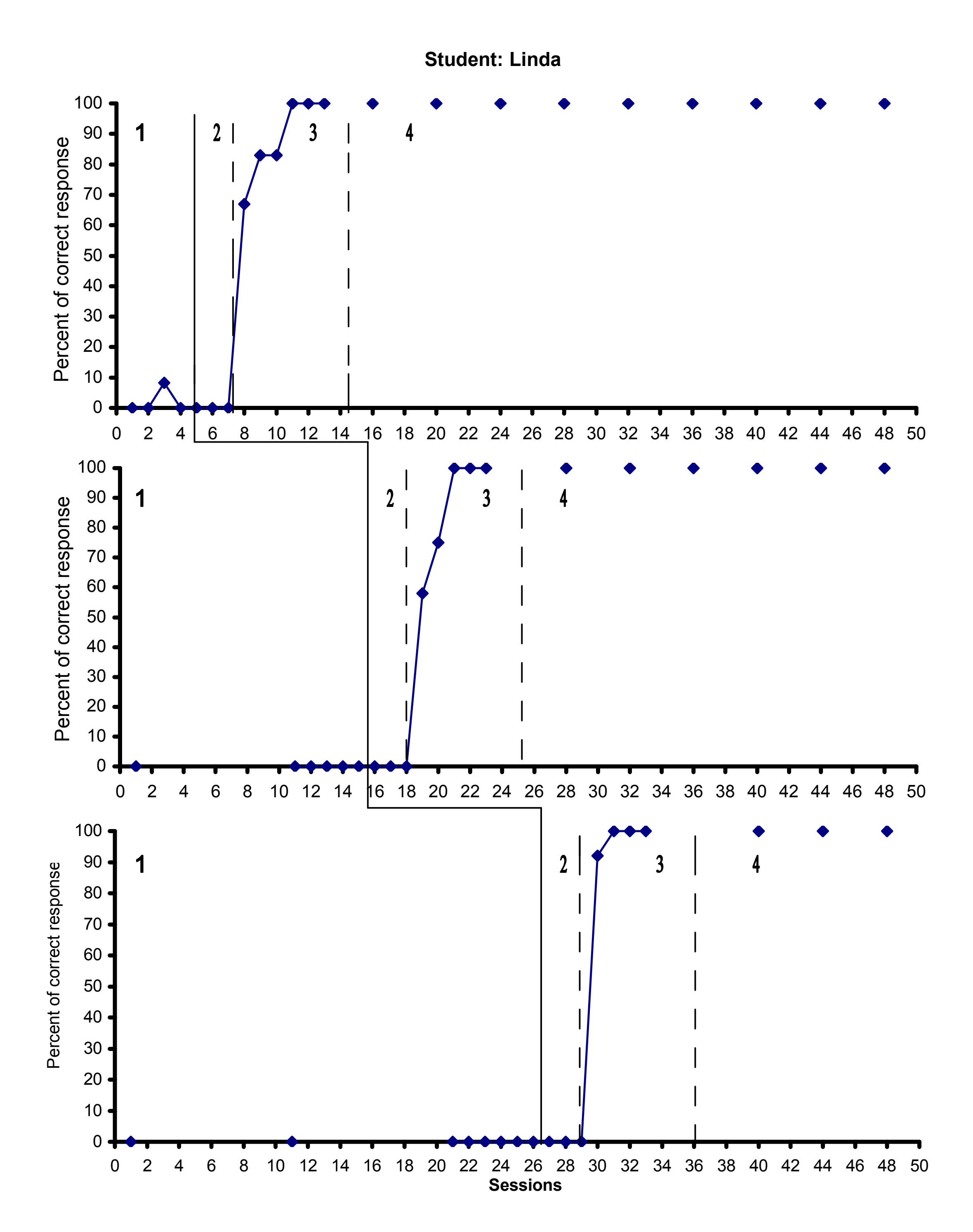


Figure 5. Percent of unprompted correct response by Linda during the Constant Time Delay across the three sets of words at baseline (1), 0s delay (2), instruction (3), and maintenance (4)

Nancy. Nancy's baseline performance on the three sets of words was like Linda's, in that she correctly identified one word from set 1 during a single probe (see Figure 6). Also like Linda, she did not correctly identify any words from the three sets during any other baseline probes or when the 0s delay procedure was in effect. For the words in set 1, Nancy quickly reached 100% correct when the 5s delay procedure was introduced. Her performance improved from 0% to 67% in session 8; 83% in session9; 92% in session10, and 100% by session 11. It remained 100% correct in the next two sessions.

Like Linda, but unlike the other students, Nancy quickly mastered the words in set 2. With the introduction of the 5s delay procedure, Nancy's performance jumped from 0% to 33% correct (session 19). In the next two sessions, her performance improved to 83%. In session 22, her performance improved to 100% and remained there during the next two sessions. Linda also quickly mastered the words in set 3. When 5s delay procedure was introduced, Nancy's scores jumped from 0% to 58% in session 31. In the next two sessions, it improved to 75%, before reaching 100% correct in session 34. It remained at 100% correct in sessions 35 and 36.

Trials to criterion. There was some variability in the number of sessions participants needed to master each of the word sets (see Table 7). For four of the students (Ann, Jeff, Frank, and Mike), the number of sessions (including both 0s and 5s delay CTD sessions) needed to reach criterion for set 3 words was less than was needed for set 1 words. For the first set of words these students needed 9 to 12 sessions to reach criterion, whereas they needed between 7 to 9 sessions with set 3.

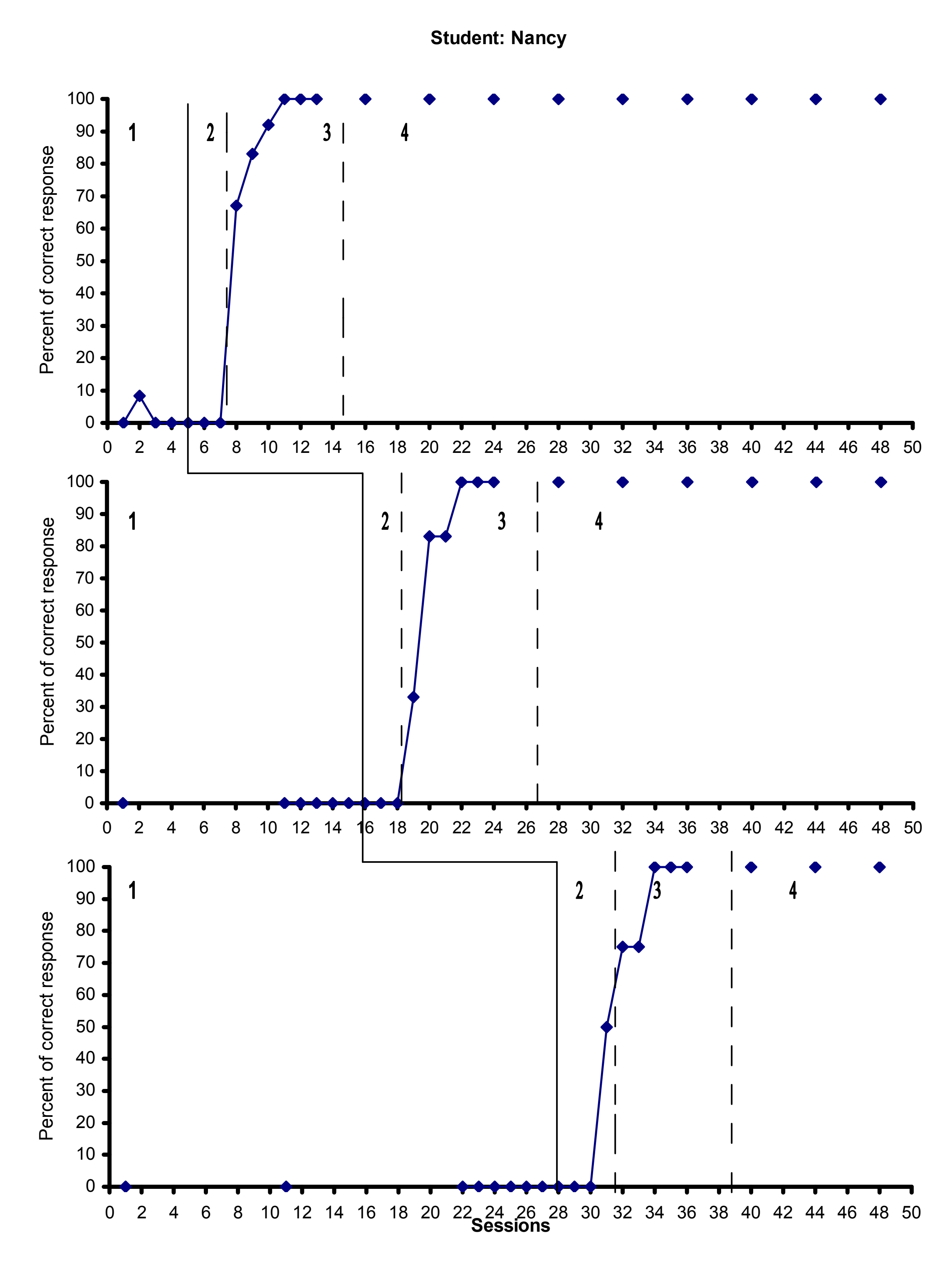


Figure 6. Percent of unprompted correct response by Nancy during the Constant Time Delay across the three sets of words at baseline (1), 0s delay (2), instruction (3), and maintenance (4)

Table. 7
Number of sessions participants needed to reach criterion

Student	Set 1	Set 2	Set 3	Total Sessions
Ann	12	15	9	36
Frank	9	13	7	29
Jeff	12	14	9	35
Mike	10	14	7	31
Linda	9	8	7	24
Nancy	9	9	9	27

The second set of words appeared to be the most difficult in all three sets, as these students required 13 to 15 sessions to reach criterion. This cannot be attributed to the hardness of the words since each student had been assigned different words. The other two students, Linda and Nancy, generally needed fewer sessions to reach mastery than their other four peers. Linda needed only 9, 8, and 7 sessions to reach criterion for word sets one through three, respectively. In contrast, Nancy required an equal number of sessions (9) to reach criteria for each set of words.

In addition, students differed in the total sessions that they needed to master all of their functional sight words/phrases (see Table 7). Ann needed 36 sessions, Jeff 35 sessions, Mike 31 sessions, Frank 29 sessions, Nancy 27 sessions, and Linda 24 sessions.

Research Question 2: Will the inclusion of related, non-target information (i.e., word definition) in the response praise and correction statement of the CTD promote the acquisition of this information

The percent of definitions that students correctly produced for items in each word set was assessed approximately every four sessions. Word definitions were included in the response praise and correction statement of the CTD procedure, but were treated as non-targeted information. The word definition probes assessed students learning of this non-targeted information. Table 8 presents students' performance on these probes. The underlined numbers represent probes administered during instruction. The numbers preceding the underlined numbers are probes administered during baseline, whereas the numbers after are maintenance. The underlined numbers in Table 8 are the pertinent data for research question two.

Table 8.
Percentage of Definitions correct by Student and Condition

Student	Word Set	Probe Sessions 1	2	3	4	5	6	7	8	9	10	11
Ann	1	0	25	42	50	50	50	67	42	42	75	75
	2	0	0	0	25	25	33	50	33	58	50	58
	3	0	0	0	0	0	0	0	0	58	67	75
Jeff	1	0	0	25	33	50	33	58	42	42	25	42
	2	0	0	0	0	50	50	58	50	50	50	50
	3	0	0	0	0	0	0	0	0	25	42	33
Frank	1	0	25	83	100	100	100	100	100	100	100	100
	2	0	0	0	33	83	100	100	100	100	100	100
	3	0	0	0	0	0	0	0	42	100	100	100
Mike	1	0	16.7	25	25	67	67	42	58	75	50	75
	2	0	0	0	0	42	75	100	100	100	100	100
	3	0	0	0	0	0	0	0	42	58	75	75
Linda	1	0	83	100	100	100	100	100	100	100	100	100
	2	0	0	0	50	100	100	100	100	100	100	100
	3	0	0	0	0	0	0	50	67	100	100	100
Nancy	1	0	67	100	92	100	100	100	100	100	100	100
	2	0	0	0	42	67	100	100	100	100	100	100
	3	0	0	0	0	0	0	75	75	100	100	100

Note: The part underlined represent probes taken during instruction for each word set. The space before the underlined number is baseline, whereas the items that follow the underlined numbers are maintenance probes.

As can be seen in Table 8, two of the students, Frank, and Linda, correctly produced all definitions for set two words by the end of the instruction. In addition, Frank correctly produced all definitions for set 3 words by the end of instruction. For these particular word sets and these students, the inclusion of related, non-targeted information during instruction promoted the learning of word definitions.

For all other students and word sets, the inclusion of the non-targeted information during instruction only partially promoted learning of word definitions. The inclusion of this information was least successful in promoting the learning of definitions in set 1 words, and about equally effective with set 2 and set 3 definitions (see Table 8). Furthermore, there was considerable variability in terms of individual performance across definitions during instruction.

Research Question 3. Will students maintain the functional sight words/phrases they acquired during instruction?

Maintenance probe sessions for functional sight words/phrases were conducted for all students approximately every four sessions after students reached criterion level (100% unprompted correct responding three sessions in a row). Another maintenance session was conducted one week after the final probe. It is important to remember that the most maintenance probes were collected for set 1 words (8 to 9), the next most for set 2 words (4 to 6), and the least for set three words (1 to 3). Overwhelmingly, students maintained the words they were taught (see Figures 1-6). Ann, Frank, Linda, and Nancy scored 100% on all maintenance probes for all three-word sets. Jeff and Mike also scored 100% for all maintenance probes for words sets 2 and 3. On set 1 words, Jeff and Mike each had one session where they failed to remember one word.

However, this appeared to be an anomaly, as they both identified each word correctly in the last five maintenance probes.

Maintenance of the non-targeted information (word definitions) was obtained simultaneously with the maintenance of targeted information (functional sight words/phrases). In Table 8, the data presented after the underlined numbers are the maintenance scores for word definitions. For three of the students (Frank, Linda, and Nancy), their scores on the definition probes improved so that they correctly gave the definition for all words by the end of the study.

The performance of the other three students (Ann, Jeff, and Mike) was much more variable. Only one of these students, Mike, reached a 100% level of correct responding on any of the three word sets. This occurred for Mike on words in set 2. For the other two sets, Mike's performance on the final maintenance probe was 75% correct.

Ann's performance on the word definitions tended to improve over time for each of the three sets of words, reaching 75% correct for set 1 and 3 and 58% correct for set 2. Jeff's performance, in contrast, was more variable, as the percent of word definitions correct ranged from 25% to 58% for set 1, and 25% to 42% for set 3 words. On each maintenance probe for set 2 words, he produced correct definition for 50% of the items.

Research Question 4. Will students generalize the functional sight words/phrases and definition acquired during instruction?

A preschool teacher who was not associated with the study assessed generalization. This probe was administered a week after the completion of instruction. Each student was presented with a set of sentences developed by the researcher that

contained all of the targeted words. The student was directed to read one sentence at a time. The teacher helped the student with any unknown words, except for the target word. After each targeted word was read, the examiner asked the student for its definition.

Three of the students (Ann, Jeff, and Mike) correctly read less than one-half of the targeted words, whereas the other three students (Frank, Linda, and Nancy) correctly read one-half or more of the targeted words correctly (see Table 9). None of the students, however, recognized all of their words correctly during generalization. Linda had the highest performance recognizing correctly 75% of her words.

Linda correctly read all targeted words from set 1 (4 out of 4), 3 from set 2, and 2 from set 3. Nancy correctly read 3 words from both sets 1 and 2. She only recognized 1 targeted word from set 3. Frank, on the other hand, was able to recognize 3 out of 4 targeted words from set 2; 2 from set 3, and 1 from set 1. For each of these three students, the position of the targeted words in the sentence had no effect on the acquisition of the word.

The three students who correctly read less than 50% of the targeted words (Ann, Jeff, and Mike) correctly read some words from all three sets. Ann correctly read only one word from set 1, and 2 words from both sets 2 and 3. Jeff, on the other hand, failed to read any of the words from set 1, but read correctly two words in both set 2 and 3. Mike, however, who was able to recognize 5 out of 12 targeted words, responded correctly to most words assigned from set 1 (3 out of 4). He only identified 1 targeted word from sets 2 and 3. It was observed that Ann and Jeff were able to identify best those words that came at the beginning of the sentence (i.e., "<u>Open</u> the car door") and

Table 9.

Percentage of Correct Words and Correct Definitions During Generalization Probe

Student	Percent of word correct	Percent of definitions Correct
Ann	42	42
Jeff	33	33
Frank	50	50
Mike	42	42
Linda	75	75
Nancy	58	58

Note: Functional sight words/phrases and their definitions were collected one week after the final probe. A preschool teacher who wasn't associated with the study conducted the generalization probe under researcher's supervision.

failed to read correctly those words that came at the middle or the end of the sentence. Mike identified 2 words that they came at the end sentence, one at the beginning, and one at the middle of the sentence.

As can be seen in Table 9, if a student correctly read a word in context, he or she was able to provide the correct definition for that word. Because the examiner only asked for definitions of correctly read targeted words, it is not known if students could have given the definitions of misread words.

Chapter 5

Discussion

This chapter discusses the findings for the four research questions addressed in this study:(1) Will the Constant Time Delay (CTD) procedure promote the acquisition of functional sight words/phrases, (2) Will the inclusion of related non-target information (i.e., definition) in response praise and correction statement during CTD promote the acquisition of this information? (3) Will students maintain the functional sight words/phrases and definitions they acquire during the instruction? and (4) Will students generalize the functional sight words/phrases and definitions acquired during instruction. A summary of the results, their implications, and their contribution to the literature are examined. Limitations of the study are also discussed, and suggestions for future research offered.

Summary of the results

Results of this study confirmed that CTD procedure is an effective procedure for teaching functional sight words/phrases recognition to students with moderate and severe disabilities. First, the experimenter was able to implement the CTD procedures reliably and as intended. Procedural reliability data collected in this study indicated that the investigator implemented instructional sessions with high levels of accuracy. This finding replicated previous research showing that CTD procedures can be implemented reliably in one-to-one situations with preschoolers (Alig-Cybriwsky et al, 1990; Doyle et al, 1990) and older students (Collins & Griffen, 1996).

Second, the CTD procedure was highly effective in teaching functional sight words/phrases to students with moderate and severe disabilities. Even those these

children often experience difficulties with learning, language, cognitive, and perceptual skills, the CTD procedure was an effective procedure for teaching functional sight words/phrases to the children. With the exception of two students who correctly recognized one word during baseline, all baseline probes for all words sets averaged 0% words read correctly. Introduction of the CTD procedure resulted in all students reading the criterion level of 100% words correct three sessions in a row and these results were maintained over time. The variation among participants characteristics and more specifically their intellectual abilities (students' IQ ranged from 30 to 52) may affected the speed with which students' acquire new words of phrases, but not the acquisition these targeted skills. These findings are important because they provides additional support to a rather sparse database showing that a CTD procedure is effective in improving the functional sight words/phrases recognition of young students with moderate and severe disabilities.

The study also focused on the acquisition of incidental information (i.e., word definition) that was presented during the response praise and correction statement in the CTD procedure. All of the students learned some of the definitions incidentally, with three students learning all word definitions for all three sets. The performance of the other three students was variable, but one student learned all of the definitions for one word set by the end of the study and gave the correct definitions for 75% of words for the other two word sets. The other two students' mastery of word definitions by the end of the study ranged from 33% to 75% correct, depending on the word set.

Generalization of recognizing functional sight words/phrases in a sentence context in the presence of another adult was quite variable. Accuracy ranged from 33%

to 75% correct recognition depending on the child and the word set. Thus, generalization was only partially achieved. It is interesting to note, however, that when a word was recognized correctly in context, its definition was always produced correctly as well.

I next discuss variables that may have influenced the findings in this study. These variables include: (a) previous knowledge of words, (b) acquired preferences, (c) feedback information, and (d) attentional cues.

Previous knowledge of words. Participants' previous knowledge of words must be taken into account when interpreting and generalizing the results of any instructional reading program. Knowing some functional sight words/phrases to begin with may influence the effectiveness of a particular instructional procedure and how much is learned. Fishbach-Goodman (1996), for example, reported that prior knowledge of sight words/phrases influenced the success of one of the participants in his study. This student used what he already knew about community signs (acquired previously) to the learning of flashcard and photographs for words and phrases.

In this study, three students (Alex, Linda, and Nancy) recognized some functional sight words/phrases during the pre-assessment condition (see Table 4). The two students (Linda and Nancy) who learned target words most quickly in this study recognized the most sight words/phrases during the preassessment. These findings suggest that there is a relationship between students' performance during the study and their entering reading skills. Thus, students with moderate and severe disabilities who begin instruction with strong reading skills may be more likely to benefit from CTD instruction for functional sight words/phrases. Clearly, further analysis of the impact of

previous knowledge on students' ability to learn functional sight words/phrases is needed.

Acquired preferences. The back up reinforcers used in the study may have influenced the finding. Specific preferences for reinforcers were selected based on parent and teacher feedback. For example, Ann's teacher had cautioned the investigator prior to the initiation of the study that Ann's had a problem with choking. She suggested that non-edible reinforces be used. Therefore, throughout the study, Ann received reinforces such as stickers, certificates, and hand stamp, instead of edible reinforcers. It was also necessary to change the type of reinforcers used with one of the students (Frank). It was necessary to change this child's reinforcers because he had become noncompliant. In evaluating the effectiveness of the CTD procedure used in this study, it is important to keep in mind that the reinforcement procedures were an integral part of this treatment. Future research for students with moderate and severe disabilities should analyze the impact of each of the components of this CTD procedure.

Feedback statements. Feedback statements or information included as part of the CTD procedure may also have influenced students' performance. Feedback statements that were inserted included: (a) positive reinforcement for correct responding during instruction, (b) intermittent reinforcement for attending during instruction, and (c) instructive feedback with correct and incorrect respond during incidental learning of functional sight words/phrases definitions. The effect of instructive feedback has received increased attention in the research literature (Collins et al, 1995; Schuster et al, 1996; Wall & Gast, 1999). Researchers have explored the effect of instructive feedback,

presented during either verbal praise or correction statement, on the acquisition of incidental learning (Doyle, Wolery et al, 1990; Gast et al, 1991; Wall & Gast, (1999). The incremental effects of such feedback were not investigated in this study, but should be explored in future research.

Attentional cues. The importance of teacher statement, or actions that promote students attention to attend to the investigator or instruction has not been widely investigated. A few investigations have compared different types of attentional cues on the acquisition of target behaviors (Alig- Cybriwsky et al, 1990; Doyle, Wolery et al 1990). These investigations made comparison between general attentional cues that require little specific interaction with more specific attentional cues that requires that the student interact more directly with the target stimulus. During this study, the investigator focused on using specific attentional cues with no attempt to examine the effectiveness of general attentional cues. He held up the word card, pointed to the word, stated the student name, asked the student to look at the word, and then read it. While the effects of the two types of attentional cues were not examined, future research needs to identify which type of attentional cue is more effective in specific situations.

Research Question Number 1: Acquisition of target words.

The results of this study replicate and expand previous research that examined the effectiveness of CTD procedure in teaching functional sight words/phrases to students with disabilities. Prior research demonstrated that the CTD procedure was effective in teaching different types of functional sight words/phrases, such as grocery and academic words, to students with moderate and severe disabilities in preschool,

elementary, middle, and high school. The procedure has also been shown to be effective when older peers delivered instruction (i.e., CTD procedure) or administered positive reinforcement (Schuster, et al, 1996).

Most importantly, the findings replicate the results from Alig- Cybriwsky et al. (1990) who showed that CTD was effective in teaching functional sight words/phrases to young children. The children in this previous study were similar in age to the ones in this study. In both studies, all students reached the desired criterion level on all target words. Both studies used three sets of words and a similar number of sessions to implement the CTD procedure (Alig-Cybriwsky used 48 sessions and this study required 50 sessions). The percentage of correct responses remained at 0% during baseline for all students in both studies (except two students in this study who correctly read one word correct one time during baseline).

The introduction of CTD, in this study resulted in the desired criterion level being reached for all students on all targeted words (100% for two consecutive sessions when reinforcement was continuous, followed by 100% for one session when reinforcement was delivered every third trail). Alig- Cybriwsky et al. (1990) reported similar findings. In this previous study, students reached criterion level of 100% for 1 session, followed by 95% for the next two consecutive sessions. Although the criterion level in Alig-Cybriwsky study was slightly lower than the criterion level set for this study, these two studies demonstrated that young children with moderate and severe disabilities can master small groups of functional sight words/phrases when learning them via CTD.

One procedural difference between the Alig-Cybriwsky (1990) and the current study involved the number and length of the delay intervals in the CTD routine. The rate at which assistance is faded may impact the skill acquisition during CTD instruction (McDonnell, 1987). Although Alig-Cybriwsky used a 3s delay in their study and a 5s delay was used in this study, there was no clear advantage in either study, as students in both investigations reached a high level of correct responding. Future research, however, should assess the relative effectiveness of different delay intervals.

Procedurally, the current study was very similar to Schuster et al. (1996) who used a 5s period and sequentially taught students three sets of words, with four words in each set. In the Schuster et al. (1996) study, participants were 10 to 17 years old and had considerably experience using the CTD procedure previously. The students in this prior study reached criterion for the first set of words in 17 sessions. In contrast, three participants in this study reached criterion in 9 sessions, whereas the other three students reached criterion in 10 to 12 sessions. Although children's learning history is assumed to influence the effectiveness of the CTD procedure (Wall, 1996), students with no previous experience with the CTD procedure in the current study, learned functional sight words/phrases relatively quickly. The learning to learn concept (Godby, Gast, & Wolery, 1987) and the correlation between learning histories and rate of skill acquisition should receive more attention in future research.

The number of sessions needed to reach the desired criterion level provides an indicator of the power of the instructional procedure. Participants in the Schuster et al. (1996) study required 62 sessions to master all 12 words. In contrast, participants in this study required only 24 to 36 sessions to learn all target words. The differences may

have been associated with the characteristics of the participating students. Therefore, additional research is needed to determine if students' characteristics are related to instructional outcomes.

Research Question Number 2: Incidental Learning.

In this study, incidental learning was assessed by examining participants' mastery of word definition embedded in response praise and correction statement. Participants in this study learned an averaged 72% of the word definitions (range = 43% to 96%) embedded in the consequence events of the CTD procedure. This mean is higher than the 58% net gain reported by Werts et al. (1995) in their review of the instructive feedback literature. When the rates of incidental learning in this study are compared to other research where word definitions were learned incidentally, the outcomes were quite impressive. Although the percent of definitions learned in this study was lower than the 90% mean averaged reported by Collins et al. (1995), it was higher than the performance obtained by Gast et al. (1990), Singleton et al. (1995), and Stinson et al. (1990).

Type of learners. Incidental learning of word definitions via CTD instruction in previous studies (Gast et al, 1990; Schuster et al, 1996) involved elementary school students with moderate disabilities. The current study extended this previous research by showing that students with severe disabilities can also learn word definitions when they are embedded in the CTD instructional regime. Future research is needed, however, to examine if incidental learning of word definitions is related to students characteristics.

Although students participating in this study functioned within the moderate and severe range (students' IQ ranged form 30 to 52), there was considerable variability in their cognitive and perceptual capabilities. Thus, differences in performance may have been related to differences in the cognitive and perceptual characteristics of students. For example, the three students (Frank, Linda, and Nancy) with the highest IQ learned definitions more quickly than the students with a lower IQ. The percentage of correct definitions for the highest functioning students ranged from 89% to 96%, whereas the lower functioning students scores ranged from 43% to 65%.

Location of definition. The location of the incidental information in the CTD regime has been reported to be a factor in learning non-targeted information. Gast, Doyle, Wolery, Ault, and Baklaz (1991) found that students learned more incidental information when it was provided in the consequence events of CTD than in the antecedent events. Similarly, Shelton et al. (1990) reported that students learned 69% of the target definitions when this information was presented in the consequence events, whereas only 41% of definitions were acquired when they were presented in the antecedent event. Although the location of the incidental information in the CTD procedure can influence the results, no attempt was made in the investigation to compare relative effectiveness of embedding incidental information in different locations. Additional research is needed, however, to replicate and extend previous findings concerning the location of embedded incidental information.

Number of exposures to definitions per session. The number of times that students are exposed to each word definition should presumable influence learning. In the current study, students learned on average 72% of the definitions with only three

exposures to each word per session. Or in other word, each student was exposed to a word's definition three times during each session in the consequence events. It is not clear if extra exposures would have increased students' performance, however. It is also possible that increasing the number of exposures in each trial may have distracted students from learning the target information; that is functional sight words/phrases. Future research should explore the relationship between the number of exposures to non-targeted information and subsequent acquisition of this information as well as any possible consequences for the mastery of target information.

Frequency of word definition probes. Participants involved in this study were tested on their ability to acquire incidental information (i.e., word definition) every four sessions. Three students maintained stable levels of performance throughout the study, whereas the other three students' learning of word definitions was more variable. Testing word definition more frequently may have been advantageous for two reasons. One, it would provide a more complete picture of incidental learning, as acquisition patterns would have been more closely tracked. Two, administration of such probes may have had an added benefit of making participants more sensitive to non-targeted information, increasingly the likelihood that they attended to this information. In any event, future research needs to assess the impact of frequency of probes on the acquisition on non-targeted information.

Research Question Number 3: Maintenance

Maintenance is important because many learned skills are incorporated into more complex skills, and if the initially learned skills are not maintained, mastery of more complex skills is likely to be hobbled (Wolery et al, 1992). One way to facilitate

maintenance is to over learn a skill. Wolery et al. (1992) reported that providing students with review sessions on previously learned behaviors can prompt overlearning for students with moderate and severe disabilities. The current study conducted maintenance probe sessions for the functional sight words/phrases for all students approximately every four sessions after a student reached criterion level. Another probe maintenance was conducted one week after the final probe. The repetition of acquired functional sight words/phrases in a short period of time seemed to help in students mastering all functional sight words/phrases in all three sets.

The manipulation of reinforcement contingencies is another method used to promote maintenance. According to Wolery et al. (1992), three different manipulations are possible: (a) thin the reinforcement schedule, (b) use natural reinforcers, and (c) delay reinforcement. All three of these procedures were used in the current study. During the maintenance probe sessions, reinforcement was given on an average of every third correct response. Providing less reinforcement as instruction progressed did not have a negative effect on students' performance, and presumably strengthened it. Natural reinforcers were also delivered in the current investigation. Teachers were provided with a list of possible reinforcers to use with the participating children. This allowed the selection of reinforcers that were commonly used by teachers and parents and thought to be effective. In addition to the natural reinforcers, the investigator facilitated maintenance by delaying the delivery of reinforcers. Rather than providing reinforcement after the unprompted correct response, the current investigation used a monetary system, where pennies were exchanged for the primary reinforcers at the end

of the week. The differential effects of each of these reinforcers are unknown and should be investigated in future research.

Although maintenance effects were quite impressive, three students failed to maintain all words on all maintenance probes. This variability appeared to be related to students' cognitive abilities, as the three students who failed to maintain a 100% accuracy rate on all probes had the lowest scores on IQ tests. The effects of IQ and other intrapersonal variables on the maintenance of functional sight words/phrases should be investigated in future research.

Nevertheless, it is important to point out that the maintenance results obtained in this study were quite impressive, as students average scores on maintenance probes was 96% correct. This replicates a study by Doyle. Wolery, Gast, Ault and Willey (1990). They demonstrated that young children with low cognitive functioning were able to functional sight words/phrases taught via CTD. Students in that study, with a mean IQ of 53, correctly identified an average of 97% of words correctly on maintenance probes.

Research Question Number 4: Generalization

The ultimate test of instruction is students' ability to apply learned skills in new situations (Ryndak & Alper, 1996). One week after the final maintenance probe was administrated, a preschool teacher not associated with the study assessed generalization. This generalization probe measured students' ability to read the target functional sight words/phrases in text (near generalization). Generalization was conducted in the same resource room were students learned were taught. There was no attempt to assess generalization in across the actual community signs in the natural environment. Although students had mastered the words in training, they were only moderately

successful in applying learned skills in a new situation. Three students correctly identified 50% or more of he taught words in text, whereas the other 3 students performance was below the level of 47% correct.

These percentages are lower than the percentages for generalizations reported in similar studies by Alig- Cybriwsky et al. (1990) and Schuster et al. (1996). For example, Alig- Cybriwsky et al. indicated that participants were able to generalize 79% of the words taught. One possible reason for why the current results differ from those of Alig-Cybriwsky et al. is that the person conducting the generalization probe in the previous study was the examiner. This may have had a positive effect on their findings.

Nevertheless, Schuster et al. (1996) indicated that 8 students in their study correctly generalized 87% of targeted words with a different investigator. The difference in performance in the current study and Schuster et al. probably relates to when the generalization probe was administered. In the current study this was done one week after maintenance, in the former study it was conducted immediately after instruction. The short period of time between instruction and the generalization probe in Schuster et al. undoubtedly enhanced performance on their generalization probe.

Future investigation needs to examine the effects of student characteristics on generalization as well as placement of taught words in the generalization probe. Students in this study with less severe cognitive impairments tended to do best on the generalization probe. In addition, several students in the current study appeared to read words correctly when they were placed at the beginning of a sentence, but had difficulty if the word was placed in the middle or at the end of a sentence. Finally, it is important

to examine the effect of assessing generalization in the natural environment to determine if learned skills can be applied in a meaningful manner**.**

Limitation

Although this study showed that the CTD procedure is an effective method for teaching functional sight words/phrases to students with moderate and severe disabilities, there are several of limitations that impact these findings. These include:

1. Reliability data were not collected on the word definition measure. This must be kept in mind when interpreting results. This measure has been scored reliably in previous studies (Schuster et al, 1996), however. Furthermore, the only definitions that participants gave in the current study were the ones embedded in the consequence event.

2. Reliability data were not collected for the generalization probe. This must be kept in mind when interpreting results. Reliability was only conducted during the instructional sessions.

3. Although students learned the definitions of some functional sight words/phrases incidentally, it is not clear if they understood these definitions. Further research needs to examine if learned definitions are understood and can be applied in a community setting.

Conclusion

The purpose of this study was to examine the effectiveness of the CTD procedure as a mechanism for teaching functional sight words/phrases and word definition to students with moderate and severe disabilities. It was predicted that students with moderate and severe disabilities would acquire, maintain and generalize

the functional sight words/phrases taught as well as learn incidentally definitions of words that were embedded in the consequent event of the CTD procedure. The study confirmed that CTD procedure is an effective method for teaching functional sight words/phrases recognition and fostering incidental learning of word definitions for children with moderate and severe disabilities.

The CTD procedure used in this study was relatively easy to implement and was implemented with a high degree of fidelity. Treatment validity data showed that the investigator implemented 96% or more of the steps as intended. Accuracy and ease of implementation make CTD a viable tool for classroom use.

Although the CTD procedure was an effective procedure for teaching functional sight words/phrases to students with moderate and severe disabilities, it is important to note that there was some variability in students' performance. For instance, the number of trials needed to master functional sight words/phrases varied across students and word sets. Furthermore, while most students maintained their mastery of all functional sight words/phrases over time, this was not the case for all students. Somewhat similar outcomes were observed for the incidental learning of word definitions. The average number of definitions learned by students ranged from 43% to 96%. Future research needs to examine factors, both inherent to the student and pertinent to the experimental routine that contributes to this variability.

Finally, the students' generalization of functional sight words/phrases and their corresponding word definitions to a new investigator and different task were mixed. Generalization can be difficult to obtain with children with moderate and severe

disabilities. Thus, additional research is needed to examine methods for increasing the generalization of target and non-target information when using the CTD procedure.

Appendix A

Teacher Questionnaire of Prerequisite Skills

Teacher Questionnaire

Dear Teachers,

In order to identify participants in my research study, it is important to collect data on their level of prerequisite skills. Therefore, this questionnaire checks to see if ________ will be able to qualify to participate in the study. Please read each item carefully and circle YES or No for each item. If you have questions, please don't hesitate to call me at (301) 919-9009.

	Yes	no
1) Able to respond to auditory and visual stimulus (Pictures, objects, words).	___	___
2) Able to use visual identity matching skills (i.e., match object and skill) using target words.	___	___
3) Has minimal functional sight words/phrases reading ability (student can identify at least three survival words).	___	___
4) Complies with the verbal directions (for example, "Read the word")	___	___
5) Able to wait for assistance for at least 3 seconds on a new.	___	___
6) Remains on task for at least 10-minutes.	___	___
7) Able to verbally imitate letter and word names.	___	___
8) Able to imitate two words (for example can repeat, "Come here").	___	___
9) Able to imitate three words (for example can repeat, " Time to eat").	___	___
10) Able to select reinforcers from a provided array.	___	___
11) Able to use appropriate eye contact with the teacher and stimulus materials.	___	___
12) Attend school on a regular basis.	___	___

Appendix B

Parent Consent Form

Parent Consent Form

Dear Parents,

This letter is from Mr. Bander Alotaibi, a doctoral student at the University of Maryland, College Park. I will be conducting research to complete my doctoral degree in the field of special education in the area of severe disability. This work will be under the direction of Professor Steve Graham at the University of Maryland.

I will be conducting a study that will examine the benefits of two instructional procedures for teaching children to read words and identify what they mean. With the first instructional procedure, constant time delay, each student will be taught twelve functional sight words/phrases that are selected on the base of the child's current learning needs and his or her IEP goals. With the second instructional procedure, incidental learning, students will be taught functional sight words/phrases definitions presented during the instructional sessions. Children, who will participate in this study, will work with me 20 minutes a day, 5 times a week for ten weeks. Instruction will take place in your child's school. To determine the benefits of this instruction, each child will be regularly assessed on the words they are taught and their definitions. It is expected that your child will learn words and definitions that will be as useful in the community as at school. Available test information from each child's file will also be collected.

All information that will be collected in this study is completely confidential. Your child's name, and the school's name will not be used in any reports or presentations of the results of this study. Participation in this study poses no risk to your child, as the instruction provided is based on sound teaching procedures, and should improve your child's reading skills. You may withdraw your child from participation in this study at any time if you decide that is not in you or your child's best interest to continue.

I hope that you decide that your child can participate in my study. If you have any question. Please feel free to contact Bander Alotaibi at If you wish to give permission for your child to participate in this study, please sign the attached form and return it as soon as possible to your child's teacher. Thank you.

Bander Alotaibi

Parent Consent Form

Dear Parents,

This letter is from Mr. Bander Alotaibi, a doctoral student at the University of Maryland, College Park. I will be conducting research to complete my doctoral degree in the field of special education in the severe disability area. This work will be under the direction of Professor Steve Graham at the University of Maryland.

I will be conducting a study that will examine the benefits of two instructional procedures for teaching children to read words and identify what they mean. With the first instructional procedure, constant time delay, each student will be taught twelve functional sight words/phrases that are selected on the base of the child's current learning needs and his or her IEP goals. With the second instructional procedure, incidental learning, students will be taught functional sight words/phrases definitions presented during the instructional sessions. Children, who will participate in this study, will work with me 20 minutes a day, 5 times a week for ten weeks. Instruction will take place in your child's school. To determine the benefits of this instruction, each child will be regularly assessed on the words they are taught and their definitions. It is expected that your child will learn words and definitions that will be as useful in the community as at school. Available test information from each child's file will also be collected.

All information that will be collected in this study is completely confidential. Your child's name, and the school's name will not be used in any reports or presentations of the results of this study. Participation in this study poses no risk to your child, as the instruction provided is based on sound teaching procedures, and should improve your child's reading skills. You may withdraw your child from participation in this study at any time if you decide that is not in your child's best interest to continue.

I hope that you decide that your child can participate in my study. If you have any question. Please feel free to contact Bander Alotaibi at   If you wish to give permission for your child to participate in this study, please sign the attached form and return it as soon as possible to your child's teacher. Thank you.

Consent

I give permission for my child,_____________________, to participate in the study described above. I understand that this includes permission for my child to receive instruction in reading skills during the school day. I also understand that the investigator will be working with my child 20 minutes a day, 5 times a week, for 12 weeks. I further understand that test information will be collected from my child's school file. I know that all information will be confidential, and that my child's name, my name, and the school's name will not be used in any reports or presentation of this study. Finally, I understand that I have the right to withdraw my child from the study at any time.

Child's Name: ______________________________ Date: _________________

Signature of Parent/Guardian: ____

Appendix C

Reinforcement Survey

Reinforcement Survey

Dear Teacher,

The following is a list of back up reinforcers that I am planning to use with the students in my study. I would like for you to indicate which items are appropriate for______, and which items you would prefer that I use a reinforcer. All items will be exchanged for pennies that students earned during instruction. These items will vary in value, with some costing more pennies than others. Place a check in the box by each item that is appropriate and a check in the box indicating which items you prefer that I use as reinforcers. Thank you in advance for your thoughts and time.

Edible Reinforcers	Appropriate	Preferred
1. Candy (Be Specific)	________	________
2. Fruit juice	________	________
3. Soft drink (Be Specific)	________	________
4. Chewing gum	________	________
5. Chips	________	________
6. Crackers (Be Specific)	________	________
7. Fruit		
8. Cookies	________	________
9. Doughnut	________	________
10. Yogurt	________	________
11. Jello	________	________

Non-edible Reinforcers	Appropriate	Preferred
1. Rubber ball ("Super Ball")	________	________
2. Novelty key chain	________	________
3. Miniature flashlight	________	________
4. Stickers	________	________
5. Certificate	________	________
6. Badges		
7. Hand stamp of cartoon characters	________	________
8. Colorful ribbons	________	________

Other item that you would recommend:

Appendix D

Functional sight words/phrases List

Functional sight words/phrases List

Dear Teachers:

The following is a list of functional sight words/phrases from the Reading Problem Book by Richek et al. (1996). These are the words that I will teach to _________. Please look at each word and check if it is appropriate to the child's IEP goals and to the child's ability levels. If a word is not appropriate do not place a check in the accompanying box. For the purpose of my study, each student will learn 12 words and their definitions. If you have questions, please call feel free to call me at (301) 919-9009.

Word	Appropriate to student's IEP goals	Appropriate to student's ability level
1. Farm		
2. Open		
3. Closed		
4. Fence		
5. Bus Stop		
6. Balloon		
7. Out		
8. Entrance		
9. House		
10. Hospital		
11. Telephone		
12. Television		
13. Hot		
14. Police		
15. Apple		
16. School		
17. Information		
18. Teacher		
19. Keep out		
20. Eye		
21. Danger		
22. Do Not Enter		
23. Do Not Walk		
24. Hand		
25. Snow		
26. Rain		
27. Shoes		
28. Bed		

29. Chair		
30. Table		
31. Spoon		
32. Fork		
33. Truck		
34. Bird		
35. Ear		
36. Tree		
37. Mirror		
38. Bag		
39. Stop		
40. Candle		
41. Fire		
42. Dish		
43. Hair		
44. Children		
45. Lion		
46. World		
47. Picture		
48. Pull		
49. Push		
50. Radio		
51. Clown		
52. Bread		
53. Castle		
54. Wet Paint		
55. Bicycle		
56. Baby		
57. Walk		
58. Horse		
59. Ring		
60. Exit		

Appendix E

Functional sight words/phrases and Definitions

Functional sight words/phrases and Definitions

Dear Professors and Teachers,

Listed below is a list of functional sight words/phrases and their proposed definitions to be used in my study to teach functional sight words/phrases recognition to students when using the Constant Time Delay procedure. Please take a moment to review these words and their definitions and indicate whether or not you feel that they are, in your opinion, pertinent and appropriate. Thank you in advance for your cooperation.

Word	Definition
1. Farm	a place where animals live (i.e., cows and chickens)
2. Fence	something that keeps the dog in the yard
3. House	A place where people live
4. Apple	a fruit that you eat with different colors (red, green, etc)
5. School	where we go to learn
6. Teacher	Person who helps us in class
7. Keep Out	means do not go in
8. Eye	what you see with
9. Hand	where your fingers are
10. Snow	frozen rain that falls from sky
11. Rain	water that falls from sky
12. Shoes	what you put on your feet
13. Bed	what you sleep on
14. Chair	what you sit on
15. Table	what you eat on
16. Spoon	what you eat cereal with
17. Fork	what you eat dinner with
18. Exit	is the way you go out
19. Open	means that we can go in

20. Walk	its safe to cross the street
21. Ear	what you hear with
22. Bird	animal with feathers that flies
23. Tree	where birds live and leaves grow
24. Children	your brothers and sisters
25. Lion	animal in jungle that roars
26. Baby	little child that cries a lot
27. Horse	an animal on the farm that says “neigh”
28. Bus Stop	is where you wait to ride on the bus
29. Closed	means we can’t go in
30. Danger	be very careful, it can hurt you
31. Do Not Enter	we can’t go in that way
32. Do Not Walk	its not safe to cross the street
33. Hot	don’t touch; you could get burned
34. Out	is where you go if you want to leave
35. Pull	grab the handle and move it to your body
36. Push	grab the handle and move it away from your body
37. Stop	means don’t move, look both sides before you move
38. Telephone	is what you use to call your friends
39. Truck	bigger than a car

Appendix F

Matrix for Scripted Behavior

Matrix for Scripted Behavior during Screening,
Probe, and CTD Procedure

The investigator will sit across a table from the student in the classroom, place the words on the table in front of him, and hold up the first card with the word and its definition on it. During the screening the investigator will test the students on all sixty (60) words. In the probe and CTD procedures the investigator will test all twelve (12) targeted words with each student. Each word will be tested for 3 trials either in the preassessment and probe procedures or during the instruction.

PRE SCREENING PROCEDURES
"Purpose: to select Unknown words"

<u>INVESTIGATOR</u>	<u>STUDENT</u>
Point to the word "Student name"and deliver the task direction ("Look at the word. Read the word")	The student will be allowed students will be given 5s before the investigator marks the student response as correct or incorrect.
Reinforces behaviors other than the target word (i.e., sitting appropriately or working hard). Records word as correct or incorrect.	
"What does______ mean?"	The same procedure as above will be implemented.

BASELINE PROBE PROCEDURE
"Purpose: to collect information on the chosen words prior intervention."

<u>INVESTIGATOR</u>	<u>STUDENT</u>
Point to the word "Student name" and deliver the task direction	The student will be allowed students will be given 5s before the

("Look at the word. Read the word")

investigator marks the student response as correct or incorrect.

Reinforce behaviors other than the target word (i.e., sitting appropriately or working hard). Records word as correct or incorrect.

"What does______ mean?"

The same procedure as above will be implemented.

0S SECOND DELAY PROCEDURE

INVESTIGATOR	STUDENT
"Student's name, Read the word" (without waiting state the word)	
	Student gives a correct response
Verbally praise him, repeat the word with the definition (e.g., "Good job," "That's right" this word is "Exit" and means the way you go out, and gives the student one penny.	
	Student gives an incorrect response.
"That's wrong, (Student name)" then repeats the word with the definition, waits for 3s latency before moving to the next word.	
	Student does not respond
Repeats the word with the definition (e.g., this word is "Exit" and means…),	

waits for 3s latency period before moving
to the next word.

5sECOND DELAY PROCEDURE

INVESTIGATOR	STUDENT
"Student's name Read the word" (i.e., silently counts to himself, :1,001; 1,002; 1,003; 1,004; 1,005).	
	Student anticipated and stated the correct response.
"Good job, (Student's name)" then repeats the word and provides the definition (e.g., "That's right, this word is "Closed" and means we can't go in), and gives the student one penny.	
	Student states the word correctly after the delivery of the controlling prompt.
Verbally praises the student, then repeats the word with the definition, and gives the student one penny.	
	Student states the word incorrectly within the 5s delay
"Wait if you don't know" repeats the target word with the definition, and waits for a 3s latency period before moving to the next word	
	Student states the word incorrectly or does not respond after the delivery of the controlling prompt.
Repeats the word with the definition, Waits for a 3s latency period before moving on to the next word.	

Appendix G

Recording Sheet for 0s

Constant Time Delay Procedure

Recording Sheet for 0s
Constant Time Delay Procedure

Student:_________ Session: _________ Start Time:_____

Date: _________ Delay Interval:________ Stop Time:_____

Task: __________ Total Time:_____

Trial/ Step	Stimulus/Task Analysis	Delay	Student Responding		
			Correct response	Incorrect response	No response
1	Bus	0			
2	Exit	0			
3	Stop	0			
4	Walk	0			
5	Stop	0			
6	Bus	0			
7	Exit	0			
8	Walk	0			
9	Exit	0			
10	Stop	0			
11	Walk	0			
12	Bus				
Number of Each Response Type					
Percent of Each Response Type					

Appendix H
Recording Sheet for 5s
Constant Time Delay Procedure

Recording Sheet for 5s

Constant Time Delay Procedure

Student:_________ Session: _________ Start Time:_____

Date: _________ Delay Interval:________ Stop Time:_____

Task: __________ Total Time:_____

Trial/ Step	Stimulus/ Task Analysis	Delay	Student Responding				
			Unprompted Correct	Prompted Correct	Unprompted Error	Prompted Error	No Re-ponse
1	Bus	5					
2	Exit	5					
3	Stop	5					
4	Walk	5					
5	Stop	5					
6	Bus	5					
7	Exit	5					
8	Walk	5					
9	Exit	5					
10	Stop	5					
11	Walk	5					
12	Bus	5					
Number of Each Response Type							
Percent of Each Response Type							

Appendix I

List of Generalization Sentences

List of Generalization Sentences

Student:_________ Session: _________ Delay Interval:________

Start Time:________ Stop Time:_________ Total Time:________

Date: __________

1. The ball went over the fence
2. I like red apple
3. I like my school
4. My teacher smiles a lot
5. That sign says “Keep out”
6. I can see very far with my eyes
7. Five fingers are on your hand?
8. What color is snow?
9. The rain falls from the sky
10. Tie your shoes first
11. Make your bed
12. Don’t stand on the chair
13. Your food is on the table
14. You eat cereal with a spoon
15. Eat your pie with your fork
16. Exit the door for the bus
17. Open the car door
18. Mom cleans your ear
19. That sure is a tall tree
20. The children are playing
21. The baby is sleeping
22. Wait for the bus at the bus stop
23. The grocery store is closed
24. It is danger to play with matches
25. Do not enter the closet
26. Do not walk in the mud
27. It gets hut outside
28. Please let the dog out
29. Push the door closed
30. Stop what you are doing
31. The telephone rings
32. The red house is big
33. Walk on the sidewalk

Appendix J

Procedural Reliability Data Sheet

Procedural Reliability Data Sheet

Investigator:_________ Condition: _________ Start Time:_____

Observer:_________ Delay Interval:________ Stop Time:_____

Date: __________ Total Time:_____

1. Holds up the card and points to the word									
2. States the attentional cue ("student's name" Look at me).									
3. Delivers the task direction: "Look… Read…"									
4. Presents the controlling prompt (flashcard).									
5. Waits for correct delay.									
6. Waits for the latency period									
7. Gives positive feedback for correct response.									
8. Says NO for incorrect response.									
9. Provides the definition of the word.									
10 Waits for correct delay interval.									
12. Gives positive feedback for correct response.									
13. Repeats the word for incorrect or no response									
14. Moves to the next word.									

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